COAL AGE

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CONSERVATION as indicated by high percentage extraction of our coal areas is a question of great moment, but elimination of the larger wastes of human effort is even more important. Losses of material things are visible; a lack in operating efficiency is less tangible. The former stirs us deeply; the latter is but vaguely appreciated.

At no time in history has the demand for competent men been so far in excess of the supply. Too many are looking for the ready-made man, and too few are willing to secu e competent help by themselves training employees. The idea that "Captains of industry are born, not made ' is too broad; men must be trained right, as well as born right. No great man can compete wi h a number of ordinary men efficiently organized.

In the future, *system* will come before the *man*. Under efficient management, the superior man rises more surely and more rapidly than ever before. The correct synonym of *conservation* is *national efficiency*, and the latter can be brought about by the general adoption of systematic management, rather than by the discovery of extraordinary men.

Good management is an exact science, based upon definite laws. Fundamental principles are applicable to all activities, whether individual or corporate. Any scheme where the organization of employers, as well as employees, is for war rather than peace, is poorly devised. The chief aim of every plan should be to secure maximum prosperity for both employer and employee.

If an operator and miner working together become so skillful that they can mine two tons of coal while a competitor and his workman mine only one ton, it is certain that the first operator can pay higher wages, and still have a larger profit than his competitor. In other words, maximum prosperity can only exist as the result of maximum productivity.

When engaged in a game of sport, the employee strains every nerve and muscle to win. If he failed to do so, he would be branded as a "quitter." But in the routine of his daily work, the same man plans to do as little as he can. If he acted otherwise, his fellow-workers would condemn and threaten him. In the labor world it is thought honorable to "soldier," and that belief is the most dangerous disease that has afflicted society today. Nothing would do more toward promoting prosperity and eliminating poverty than doing away with the ancient and respectable habit of "killing time."

The fallacious reasoning that causes workmen to approve "soldiering" is based on the belief that "a material increase in the output of each man or each machine results finally in throwing a number of men out of work." It is also true that the evil habit has been fostered by defective systems of management, which include a total ignorance on the part of employers as to the proper time in which work of various kinds should be done.

The tendency to "take it easy" is encouraged also by "rule-of-thumb" methods, which should be replaced by scientific schemes, based on a careful study and elimination of unnecessary motions, and the substitution of fast for slow methods of working. There are at least a dozen ways of doing each act in mining coal, and for the same reason there is a variety of implements used for each class of work.

There is always one method and one implement which is better and faster than any of the rest, and it is in the discovery, selection and development of these higher efficiency methods and tools that the value of scientific management rests. All old systems make it imperative that each man shall do his work as he thinks best, without help or advice from the management. This plan makes it impossible for employees to work in accordance with scientific rules, even where such laws exist. It is just as essential to know how to manage men efficiently, as it is to handle problems in ventilation, pumping or haulage.

The Lanchow Mines in China

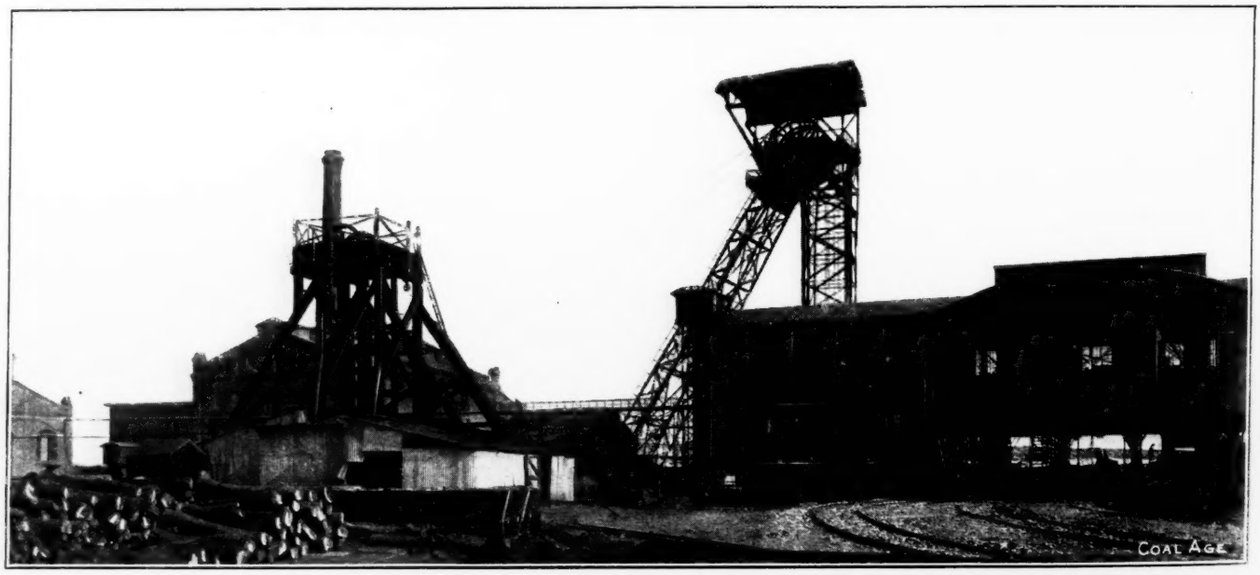
By K. P. Swensen *

The Lanchow Company is purely a Chinese institution, but under the technical management of three German engineers. These men, following the dictates of their training, have built up a plant of wonderful permanency. Among the many problems encountered, one of the most serious was the difficulty in overcoming the oriental prejudices and customs.

*Mining engineer, Nanking, China.

The best known and most extensively worked coal field in China, is that district in the northeast part of the country. This area extends west from the Gulf of Pechihli to the vicinity of Peking and the western boundary may be said to follow southward approximately in the direction of the south branch of the Great Wall, traversing the border line between the provinces of Chi-Li and Shan-Si and southward into Ho-Nan. Nothing but the merest conjecture can give one an idea of the vast quantity of coal lying in reserve in this area, from which, at the present rate of consumption, there is probably a supply sufficient to provide the world's needs for several centuries.

Of the many districts in the field, the most important and oldest is that of the Kaiping district, situated along the line of the Imperial Railways of North China 60 miles north of Tientsin. The principal operator in this district is the Chinese Engineering and Mining Co. which has its largest plant in Tongshan. It is interesting to note that the history of this company from the date of its beginning in 1879 up to the present time, correlative as it is with the modern industrial progress in China, is typical of the manner in which the whole of China has slowly and hesitatingly accepted the Western innovations in industry, government and commerce during the process of her awakening.



GENERAL VIEW OF THE LANCHOW MINING CO.'S SURFACE PLANT, SHOWING AUXILIARY HOIST TO THE LEFT

PREJUDICES OF THE ORIENT

Enterprises in China, whether the result of foreign or Chinese initiative, have always had the wall of native prejudice and ignorance to contend with. This feeling exists, to a certain extent, to this day, as may be noted in the extreme difficulty that foreigners or progressive Chinese have in obtaining concessions favorable to modern mining development, or in any of the industrial enterprises in which foreign control is concerned. The attitude of the Government, however, is very strongly in favor of native enterprises at all times and gives every encouragement it can to such ventures. Lack of capital, or unwillingness on the part of the Chinese to invest in new and unfamiliar undertakings, continues to be the reason of the present undevelopment of her vast mineral resources.

When we consider the extremely low cost at which the Chinese are able to mine coal with their cheap labor and modern machinery, there is every reason to believe that in a comparatively short time, they will find a market on the Pacific Coast region of America, notwithstanding the coming completion of the Panama Canal, unless the Alaska coal fields become heavy producers. Lack of shipping ports with good harbors, and of railway and steamship transportation facilities are at present the drawbacks to the Chinese in realizing this ambition.

There is a need for a world market for Chinese coal, as there now seems to be an oversupply in the Orient of all coals except the navy lump. Local needs are therefore easily supplied by the production of the present plants in operation. In the Kaiping district a fair grade of bituminous coal sold at the mine at as low a price as $1.10 per ton during the summer of 1911, when competition among the different companies was keen. This allows for a very meager profit or none at all on a heavy investment even though coal may be mined in China at a figure that is easily one-half of what must be paid in the United States.

SHIPPING CONDITIONS

A Chinese coal mining company of Kaiping district, known as the Lanchow Mining Co., has recently started to produce coal and coke in competition with the Chinese Engineering and Mining Co. The company's property lies between the Tongshan and Linsi mines and the workable coal seams extend for a distance of about 15 miles. The parent shaft of the mines is at Machiakow, which is three miles from the railway station at Kaiping. A standard gauge railroad, operated by the company, is used for hauling the company's product to Kaiping, from which point it is shipped to the port of Tongku and also to Tientsin.

The shipping port of Tongku is ice

bound in winter, which prevents the company from shipping its product to points outside of its own local territory for at least four months of the year. Furthermore, the harbor is not deep enough to accomodate the deep sea going vessels. This places this company at a disadvantage with its competitor, the Chinese Engineering and Mining Co., who have their own private shipping port at Chin Wang Tao, which is free from ice all the year around, and from which coal may be loaded on to vessels of deep draught.

The Lanchow Mining Co. is purely a Chinese organization, started in 1909, and in which Chinese capital only is concerned; of the operating staff, there are only three foreigners in the employ of the company. These are the three German engineers, who constitute the technical management. It is the desire of the Chinese to employ only such foreign help as is absolutely necessary in the carrying on of this enterprise. In common with the practice of some of the other Chinese mining concerns, the Lanchow company has started up a mining school in conjunction with the works for the purpose of training its own engineers and officials who will eventually occupy the various positions in the management of the company. The company is at present capitalized at 4,500,000 taels,* about 3,000,000 taels having already been expended for the present surface equipment and underground development.

The Geology

The coal beds which are now being worked by the Lanchow Mining Co., occur in a limestone belt of Carboniferous formation which has been tilted and faulted, this latter being revealed in the stratification of the nearby hills which rise abruptly out of a vast area of alluvium and loess. This condition has made it necessary for the company to do its prospecting, in the tracing of outcrops, by sinking test pits. Indications of the location of the main seams were discovered from examination of the old native pit workings.

The coal-bearing formation, consisting of shales and sandstones and a variety of shaley clays, appears to be along the north fold of a syncline, which has been described by Drake.*

Beginning at Tongshan where the inclination is steepest, it follows in an easterly direction for a distance of 21 miles until Linsi is reached. At Linsi, the location of one of the Chinese Engineering Co.'s mines, the dip of the seams is only 10 deg. At Tongshan, the western extremity of the syncline, the formations have been greatly disturbed by upheavals. At the Lanchow workings, however, the seams thus far encountered are quite regular and undisturbed. There are no serious dislocations by faults and the earth pressure is not great. At Ma Chia Kow the dip of the seams is about 30 deg. and there are 13 exposed, 3 of which are workable. These are 5 ft., 23 ft. and 49 ft., 6 in. in thickness, respectively.

Present Development

The present stage of the work is largely one of development, notwithstanding the fact that at Ma Chia Kow, a coal reserve has been found which will guarantee an output of 3600 tons per day for a period of 20 years. The management contemplates a huge output in the near future, and even though the present stage of development is a mere fraction of what they hope for, after the completion of the present shaft-sinking operations and their underground connections, the engineers feel justified in expending the capital required for the present elaborate equipment. Besides the parent shaft at Ma Chia Kow, there are three other pairs of shafts situated along the strike of the seams at intervals of about 3300 feet.

The coal is characteristic in quality of that found throughout the district. It is of uniform grade, has qualities which make it well suited for steam purposes and is especially well adapted for coke manufacture. The coal has the disadvantage of being very friable. Two typical analyses of the coals are given as follows:

	No. 12 Seam		No. 9 Seam	
	Slack	Lump	Slack	Lump
Moisture	1.30	1.52	0.96	0.80
Volatile matter	23.60	25.12	26.56	27.50
Fixed carbon...	59.86	53.06	56.65	51.70
Ash	16.24	20.30	15.84	20.00

The surface equipment recently completed at the Ma Chia Kow shaft is as uptodate in point of efficiency for the economical handling of material as may be found in any part of the world. A characteristic feature noted in every industrial plant laid out by trained German engineers, is the thoroughness with which all details are worked out. To an American, visiting this plant who is familiar with the current practice at home the most noticeable feature is the very substantial nature of the surface structures and the machinery equipment, which seems to point to a policy that takes no regard for the consideration of the financial balance and adjustment of ultimate profits that would involve a limit to first cost expenditure.

The policy of great permanence prevails throughout the plant. This appears to be the practice in Europe, particularly in Germany and this mine may serve as an example of how European practice differs from that of the American operators. The buildings are roomy and sub-

Opposite View of the Surface Plant, Showing Trestle for Conveying Coal to the Boiler Plant

*The Chinese tael is equal to an ounce of silver, or about 70c. gold at the prevailing market price of silver.

*Paper on "The Coal Fields of Northeastern China," by Noah Fields Drake, A. I. M. E., Feb., 1901.

stantially built of brick. The office building, here as in all important Chinese establishments, is an elaborate one. In the eyes of the Chinese, this building must by all means come up with their ideas of the fitness of things by having it made to look as pretentious and dignified as possible. A large reception room with a number of ante rooms is always required for guests and business visitors.

Power Plant

The boiler house presents a typical illustration of the splendid surface equipment of this plant in general. There are seven fire-tube boilers of the Lancashire type which carry steam under a pressure of 180 lb. per sq.in., each having a heating surface of 1300 sq.ft. and provided with superheaters. The superheaters take the place of the economizers, found at most large boiler plants and the experience of many engineers shows them to be the most satisfactory in efficiency as well as in ease of operating and cleaning. In the firing of boilers, it is to be noted that here, as at many other plants where labor is plentiful, advantage is not taken of its cheapness. Firing is done by electrically operated mechanical stokers. The coal for firing is conveyed direct from the shaft house over a steel trestle and dumped in reinforced concrete bins over the boilers.

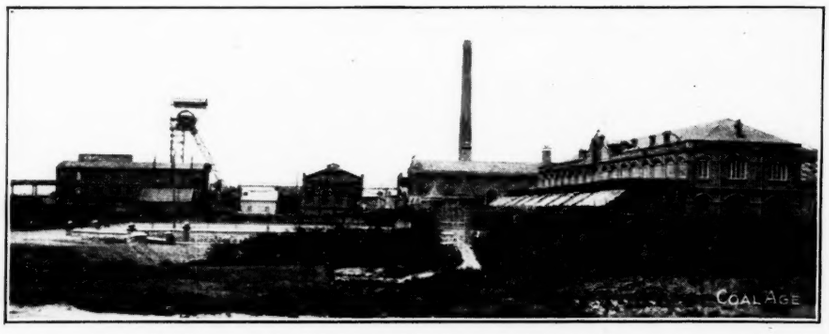
The power plant contains one unit, a compound engine and generator set of 1250 kw., which provides all the power required for running the Ma Chia plant and for furnishing lights for the other mines. A second similar unit will be installed later and also a low pressure steam turbine which will utilize the exhaust from other engines which may be run condensing or non-condensing. The voltages supplied are either 3000 or 500 according to the size of the motors, while the lights take 110 volts.

Hoisting, Ventilating and Pumping Machinery

Electric power is used in all departments of the mine except for hoisting. Eventually with the growth of the adjoining mines, it is planned to make the Ma Chia Kow plant a central power station to furnish power and light for all the works of the company.

For ventilation, the mine is provided with a main airway 4x6 ft. situated 33 ft. above the main level from which auxiliary air passages provide the circulation to the working faces and thence by way of the main haulageway to the upcast. The ventilating fans are high speed, electrically driven and two in number having capacities respectively of 87,000 and 123,000 cu.ft. per minute.

For handling the mine water, a main pumping station is being put in at the lower level, where three, electrically driven, centrifugal pumps will be installed having a capacity of 88 cu.ft. per minute each. At present the mine is making 123 cu.ft. of water per minute which is handled by one high pressure centrifugal pump and a sinking pump hung in the main shaft. The capacity of this sinking pump is 88 cu.ft. per minute and it is lowered up and down by an electric gear-driven hoist.



View Showing Surface Plant to the Left and General Offices to the Right

The air compressor is of the straight line type and has a capacity of 5300 cu.ft. per minute. The compressor plant will be added to as it is expected that air winches for underground hoisting as well as air drills will be used to a large extent in the future operations.

Shaft Equipment

The main shaft has an inside diameter of 18.6 ft. and a depth of 690 ft. The lining is of a very substantial nature, consisting of hard limestone blocks trimmed and cut to conform with the curvature of the shaft and placed in a double layer, giving a lining about 18 in. in thickness. The auxiliary shaft, the wooden head frame for which may be seen in the accompanying illustration has a depth of 350 ft. and an inside diameter of 11 ft. When the installation is completed for the main hoisting shaft, the auxiliary will be used only for an airshaft. A glance at the illustration will show how the coal is being temporarily hoisted from this shaft, conveyed to an electric elevator and thence to the coal handling floor of the shaft house.

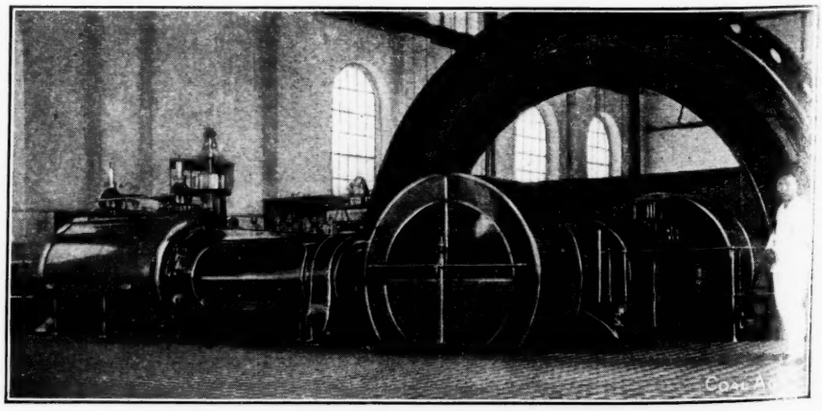
The main shaft has four compartments, all of which are to be used for hoisting coal. There is a cage for each compartment having four decks, each deck accommodating two cars each having a capacity of 0.55 tons of coal each.

To facilitate the speed of hoisting there are double landings at the underground stations and in the tipple, the arrangement allowing for two decks of loaded cars and two decks of empties being transferred at the same time. The cages are then moved a stated amount and the two remaining decks of each cage are taken care of in the same way. In the tipple house, of the two landings, the upper one is the auxiliary, from which the loaded cars are being lowered to the main floor by means of a small electric elevator. A similar arrangement is provided for at the underground loading station.

Three principal grades of coal are produced, the mine product being dumped by the ordinary car revolving tipple, on a travelling iron belt where boys usually do the picking, and thence over shaking screen. These screens feed directly into freight cars, which are hauled by the company's own locomotives to the main railway line 9 miles distant. The maximum capacity of this plant is 4800 tons per 16 hours.

The Timber Supply

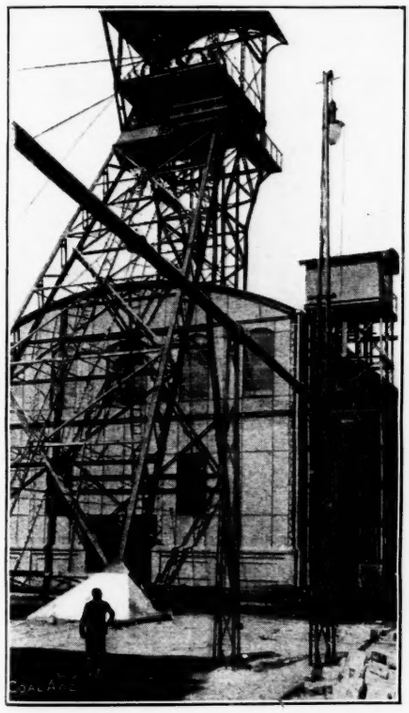
The underground workings present another example of the long life and



Interior View of the Lanchow Mining Co.'s Power Plant

permanence which is expected of the plant, such as we are not accustomed to seeing in America even in the old producers. Advantage is taken of the cheapness of labor and particularly of the skill of the Chinese as masons. All main haulageways are supported by massive masonry lining, consisting usually of brick walls and an arch made of limestone blocks; reinforced concrete is also used to a certain extent.

The timber used in the temporary openings is an inferior grade of Chinese wood, which is crooked and knotty. As the central portion of China is practically deforested, the item of supplying timbers for mining purposes must necessarily be an expensive one and in most cases, re-



NEAR VIEW OF STEEL HEADFRAME

course must be had to masonry supports where practicable. Here it may be pointed out that the native burned bricks of China are of good quality and very cheap.

For the future timber supply the company has already planted over 1,250,000 trees consisting mostly of acacias. These trees will grow from 4 to 6 in. in diameter in 5 years time and while they will only furnish timber of an inferior quality for mining purposes their planting will be profitable in other ways as the country is practically treeless.

SYSTEM OF MINING

The workings are opened up by a main haulageway parallel to the strike, and on the footwall side. Blocks of coal are exposed having 100 ft. along the strike and a length along the 40 deg. dip, corresponding to 165 ft. vertically. The filling method of mining is used throughout as the Chinese authorities object to having the surface disfigured by the caves resulting from subsidence, an occurence which would follow to a very considerable, if not a dangerous degree in the mining out of such thick seams. The seams encountered thus far have been regular in strike, dip and thickness. With the filling method in use, the system of regular extraction and watchful supervision over the laborers is not so necessary, as would be the case in mining where roof settlement plays so prominent a part. This adds to the safety of the workmen and to the ease in handling a large force of unskilled Chinese labor.

The mining of a block of coal is commenced at the base, a slice about 6 ft. in width being extracted horizontally from the roof. The coal is then conveyed in cars, or in baskets, by coolies to the temporary inclined hoisting station, from whence it is lowered or raised, as the case may be, to the main haulageway. Both compressed air and electric operated winches are used for this purpose. When a bench of coal is removed, extending across the width of the seam, the space is filled with waste rock which comes from the dead workings or from limestone quarries on the surface. The waste is shot down through chutes, which also serve as airways.

The coal is mined by the contract system in which Chinese contractors are used. There are at the present time 1200 men at work with the contracting force and 800 men employed by the mining company. The contractor is paid 18c. gold for slack and 22c. per ton for lump. Crosscutting, timbering and brick lining is paid for by contract at so much per meter.

COMPETITION AND OVER PRODUCTION

Owing to an over production of coal and coke in the North China coal areas, the Lanchow Co. has been suffering from competition which carries away the profits. It is hoped that the Chinese will eventually construct a shipping port, and with this a line of steamers of adequate size, that will give them more independence in disposing of their products.

To look into the future that lies before this company, it may be mentioned that there are iron ore bodies situated from 10 to 15 miles away from the coal mines which are said to contain large quantities of a good grade of iron ore. Negociations have already been under way towards getting foreign capital to invest in the development of these bodies of ore and the building a complete steel plant. The present company, with such an enlargement in the scope of its work, would then assume great importance as an iron and coal producer and become a factor in the ever increasing industrial development of China.

Permanent Board of Arbitration

BY E. JACOBS

A joint application has been made by the official representatives of the Western Coal Operators Association of Canada and District 18 of the United Mine Workers of America, respectively, for the appointment by the Federal Department of Labor, Ottawa, of a chairman of a permanent board to which differences between the western coal mine operators and their employees are to be referred in the event of the parties not first agreeing without such reference.

For some years it has been customary, when disputes arose, for one or both of the parties concerned to apply for the appointment by the department, under the "Industrial Disputes Investigation Act," of a Board of Conciliation and Investigation for each individual dispute in which the services of such a board were invoked, the procedure being for each party to name its representative on the board and in the event of these two not agreeing upon a chairman, the department to choose one. When the long dispute of last year, which extended over nearly eight months, was brought to a close, the desirability of having a permanent board was mutually recognized, and now the department has been asked to name a chairman in accordance with the understanding then reached.

SEVEN THOUSAND MEN AFFECTED

The Western Coal Operators Association comprises in its membership most of the operators of coal mines in Alberta and the Crow's Nest District of British Columbia situated along the main transcontinental line of the Canadian Pacific Ry. Co. and its Crow's Nest line. District No. 18 of the United Mine Workers of America has branches throughout the area thus indicated. A general strike of employees at all the coal mines and coke ovens in District No. 18 involves the cessation of work by approximately 7000 employees, beside throwing out of employment others, such as train crews, not directly connected with disputes between operators and employees. The desirability of establishing a permanent board, having the confidence of both parties and sufficiently familiar with local conditions to enable the speedy settlement of differences, is generally conceded, so that there may not again result such a great loss to both parties immediately concerned, and to consumers of coal generally, as was the case last year.

Kentucky Mining Institute

The next meeting of the institute will be held at Lexington, Ky., June 10 and 11, as noted in COAL AGE of May 4, p. 969.

Electric Power Plants for Mines

By Henry D. Jackson *

The degree of remoteness from other plants and the probable life of the mines are two most important factors in determining the general type of electric plant for a coal-mining operation. Low fixed charges, attained by the use of inferior machinery, may be more than offset by the high operating costs which are entailed. General and detailed considerations regarding power-plant design.

*Consulting engineer, associated with Timothy W. Sprague and Frederic H. Keyes, Boston, Mass.

Electric power for use in coal mining operations may sometimes be purchased to advantage from an established source but usually must be generated on the ground where it is required. As a rule, coal mines are not so situated as to enable their operators to purchase power at a price which compares favorably with that at which they can produce it for themselves.

Not infrequently, however, conditions are such that a number of small operations can profitably combine in the erection of a central station, from which power is furnished to each plant according to its needs. In an arrangement of this kind, it is a comparatively easy matter to determine the proportion of the total cost that each operation should pay by installing meters, either at the central station or at each of the receiving stations.

Owing to the more or less isolated location of the usual coal-mining operations, the prevailing arrangement for supplying electric power consists of a generating station for each plant, although not necessarily for each mine, as there are frequently a number of separate openings, subsidiary to one principal operation.

Probable Life of Plant Important

In determining the general character of a power-plant installation of this kind, the probable life of the mining operation is of prime importance. If the supply of coal is likely to be worked out in a comparatively short time, the installation should in general be inexpensive, as in the end a considerable portion of the building and apparatus will probably have to be abandoned. It is therefore advisable to build a plant which, while satisfactory for the time it is likely to be in use, will not represent any great sum of money at the time it has to be abandoned.

The same criterion does not apply, however, to the item of machinery, or at least not to an equal extent, because this part of the equipment probably need not be abandoned and it is essential that the engines for a power installation should be strong and reliable as well as desirable that they should be of comparatively low cost. Unfortunately these two items are not as a rule entirely reconcilable. A strong and reliable engine means good workmanship, material and design and is usually fairly high in cost.

It always should be kept in mind that while apparatus of low initial cost entails correspondingly low fixed charges, on the other hand, it is extremely likely to mean high operating costs. Generally, low priced engines require an excessive amount of steam, and the capacity of the boilers must consequently be increased, which fact acts to offset the saving on the engines. Also, the maintenance charges on an inferior machine are great because of the repairs which are inevitably required by an engine that is poorly designed and constructed. Another item of expense is that resulting from the frequent shut-downs which are necessary in order to effect these repairs.

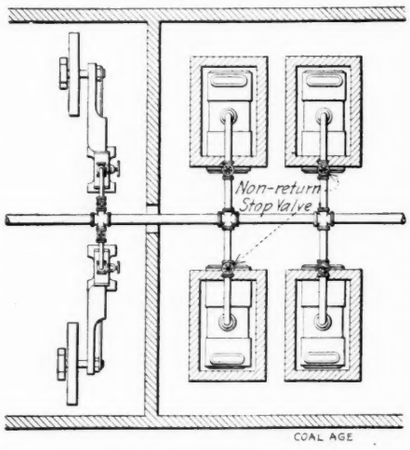


Fig. 1. Steam Main and Connections

Fixed Charges vs. Operating Cost

Therefore, in selecting the engines which are to be installed, it is essential that the questions of first cost and operating cost should carefully be considered and balanced. The load which is likely to come upon the engine through the year should be estimated as nearly as possible. On one hand, is the comparatively expensive engine with low steam consumption, small repair costs, high fixed charges on the engine and reduced fixed charges on the boiler plant. On the other hand is the comparatively low-priced engine with correspondingly high operating costs and high fixed charges on the larger steam plant which is required. Figures should be obtained on engines of different types and the operating costs and fixed charges carefully worked out. The same method of procedure should be followed out with reference to the boilers and other apparatus, until the entire plant is carefully covered.

In regard to electrical apparatus, it is equally important in this case to consider whether it is cheaper in the long run to install a direct-connected generator or a belted generator. The lower efficiency of the belted unit together with the greater space it requires, thus entailing additional cost for building and foundations, must be taken into account in comparison with the smaller building and foundations required by the direct-connected outfit of higher first cost. The generator itself should be purchased on exactly the same basis as the engine. A low-priced generator usually means exorbitant repair costs, and a high-priced generator may mean excessive fixed charges. These items must be balanced in order to obtain the best results.

Simplicity of Arrangement Desirable

In deciding on the general arrangement of a plant it is important to secure the simplest practicable form of layout, in order to insure a low first cost. Simplicity, however, does not mean the cutting out of essential features. The plant should be carefully designed to avoid, as far as possible, all likelihood of breakdowns. The best material and fittings consistent with the purpose and life of the installation, should be used throughout. A breakdown due to imperfect or inferior material will result in a loss far greater than the difference in cost between inferior and good material. Particular attention should be paid to facilities for receiving coal and for handling supplies and repair parts, also for the removal of ashes.

If more than one unit is installed, every precaution should be taken to enable the several units to be operated independently so that repairs can be made to one set of engines or boilers while the others are in operation. Interconnections between boilers and engines should be arranged so that any boiler or set of boilers can be used by any engine.

To insure continuity of operation, automatic non-return stop valves should be placed on every boiler, as it is frequently found that a boiler gives out in one way or another and allows the steam from the other boilers to blow through it, if this precaution is not taken. At prac-

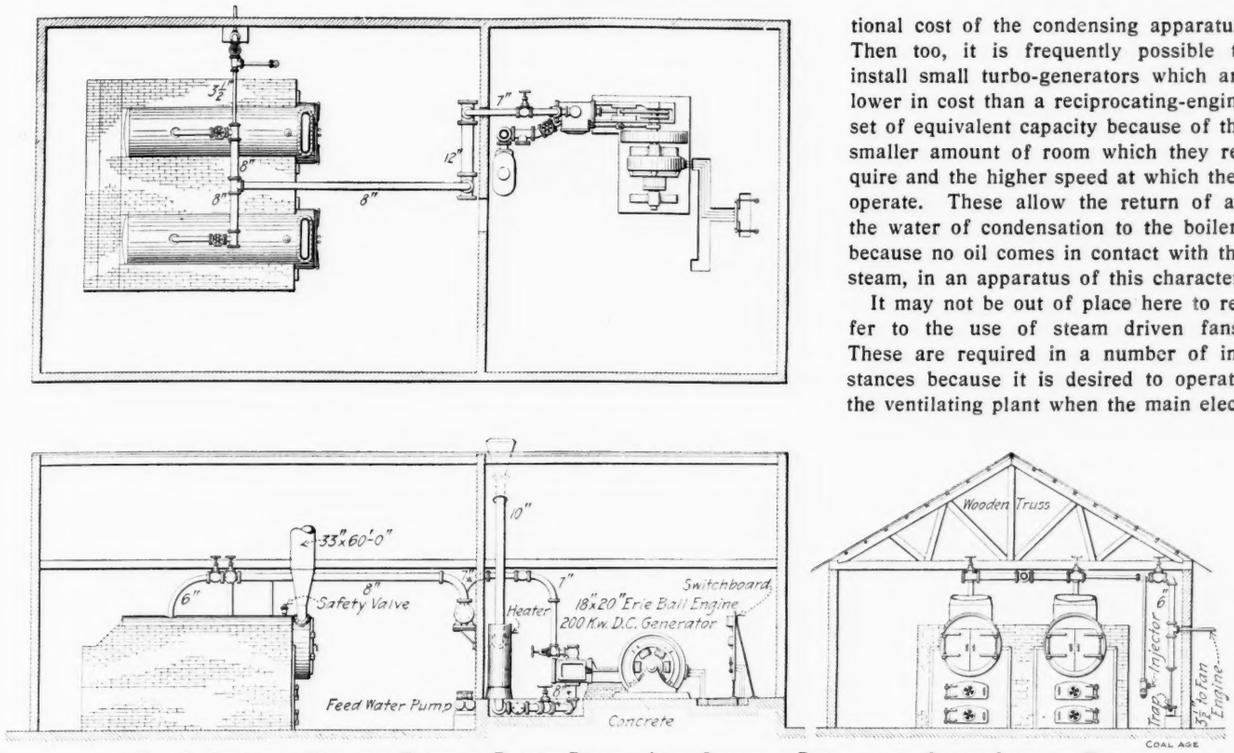


FIG. 2. SIMPLEST POSSIBLE FORM OF POWER PLANT, ALSO SHOWING DRAIN FROM STEAM LINE TO FAN

tically all mines it is quite essential that fans, pumps, and frequently the hoisting engines should always be in operation; if non-return stop valves are used, an accident to any one boiler will allow the other boilers to remain in operation unless the accident is so serious as to totally destroy or wreck the whole plant.

The piping between engines and boiler room should be as short and direct as possible, and every provision should be made to take care of expansion in the steam lines. All steam piping should be carefully drained, and valves should be so arranged that no water will be held in the pipe when the valves are closed. All pockets and loops in the piping should be drained by means of traps, and the water returned to the boilers if practicable.

FEED WATER ECONOMY

Frequently, one of the greatest difficulties in the coal fields is found in obtaining good water for the boilers, and therefore no water which has been purified by being made into steam should be thrown away if it can safely be returned to the boilers. "Safely" is here used advisedly, as it is often found that the exhaust steam which has passed through engines is contaminated with oil to such an extent that it would be unsafe to return it to the boilers. Under these conditions the use of closed feed-water heaters, or open heaters with oil separators, will allow the heat in the steam to be delivered to the feed water.

The question of whether or not to operate a plant on a condensing basis, depends entirely upon the supply of water available for condensing purposes. It is frequently found that while there may be a scarcity of water suitable for boiler supply, there is at the same time plenty of water available for cooling purposes. Under these conditions it is usually wise to operate condensing since the consequent decrease in the size of the boilers and the smaller consumption of fuel and water soon pay for the additional cost of the condensing apparatus. Then too, it is frequently possible to install small turbo-generators which are lower in cost than a reciprocating-engine set of equivalent capacity because of the smaller amount of room which they require and the higher speed at which they operate. These allow the return of all the water of condensation to the boilers because no oil comes in contact with the steam, in an apparatus of this character.

It may not be out of place here to refer to the use of steam driven fans. These are required in a number of instances because it is desired to operate the ventilating plant when the main electric generating unit is shut down. It may frequently happen in a case of this kind that the fan is located at some distance from the power station and requires the installation of a long steam line. Every precaution should be taken to absorb the expansion and contraction taking place in a line of this kind and in such a way as to avoid undue strain upon the pipe itself or upon any of the buildings.

DESIGN OF LONG STEAM LINE

Furthermore, the condensation taking place in a pipe line of this sort is likely to prove a source of considerable trouble. It is dangerous to allow the condensed water to reach the engine and it is equally dangerous to allow it to get back into the main steam line. In the first case it is liable to wreck the machine and in the second case, a slug of water in the main line may rupture the fittings. Provision should be made (1) for draining this water as it forms, and (2) for preventing it from getting to either the engine or the main steam line in case the drain fails to operate.

Another point which has to be taken

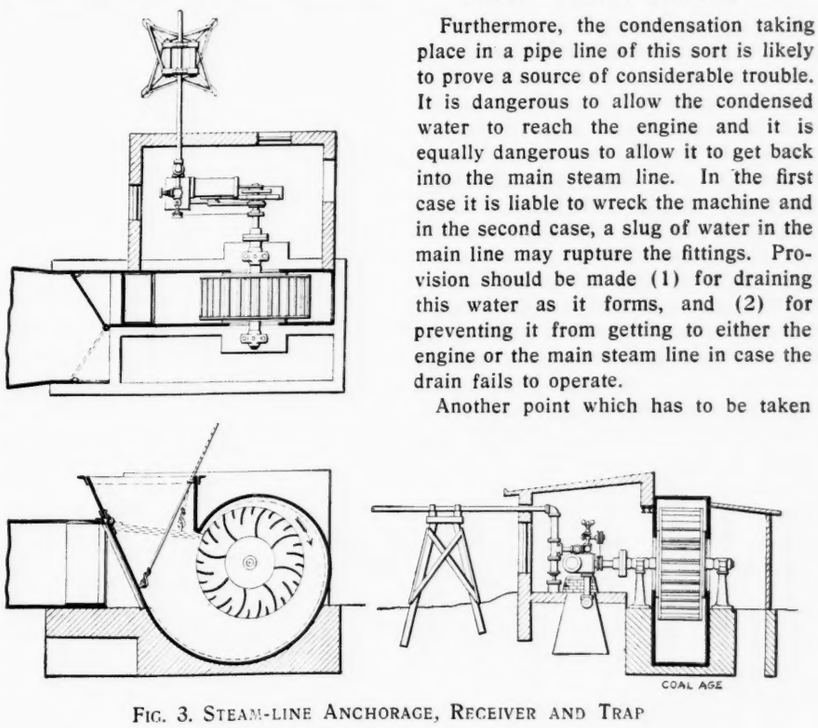


FIG. 3. STEAM-LINE ANCHORAGE, RECEIVER AND TRAP

into account in connection with a long steam line of this kind is the possibility of excessive vibration due to the intermittent flow of steam which results from supplying a reciprocating engine. This vibration frequently can be avoided by installing, at or near the fan engine, a receiver having sufficient capacity to supply the engine with steam, without materially lowering the pressure in the receiver, and thus allowing a continuous flow through the pipe. Figs. 2 and 3 show the beginning and end of a pipe line which runs to a fan engine. The anchorages and also the methods employed for preventing water from getting to either the engine or the main pipe line are illustrated.

Receivers and Steam Traps

In the end elevation of the power house, Fig. 2, it will be noted that there is shown a vertical pipe from which the fan engine line is taken off at about midway of its height. This pipe acts as a receiver for water which may condense in the steam line. The water is drained off from the pipe by means of a steam trap. At the fan engine, a similar pipe will be noticed which serves a like purpose and also acts as a receiver for smoothing out the fluctuations of the steam in the pipe line.

A layout of the power plant proper, in its simplest form is shown in Fig. 2. Provision is made for an additional boiler and engine. In case it is desired, an extra main may be provided for carrying steam from the boiler room header to the engine header, thus giving more assurance of a steam supply to either engine in case of accident. However, this arrangement is in most cases unnecessary if care is taken to purchase high grade material for the simpler form of layout.

It may be unnecessary to suggest that room should be provided in the boiler-house for the removal of tubes from the boilers but it is not uncommon to find that in existing plants such provision has not been made. Another suggestion of demonstrated practical value is the use of a stop valve between the boiler and and the blowoff valve, in order to keep the latter in good condition. This is a point which is frequently overlooked, with the result that the blowoffs leak, stick and in general are the source of much inconvenience and occasionally a shutdown.

There is usually urgent necessity for a careful analysis of all water used for boiler feed purposes throughout the coal fields. Water in these localities frequently contains, in addition to the more usual scale forming material, impurities which will rapidly and seriously injure the boilers. Under such conditions it is advisable to use some system of feed water purification. Purifying apparatus will often save many times its cost in boiler repairs. Sometimes the system of water purification may be combined with a feed water heating apparatus.

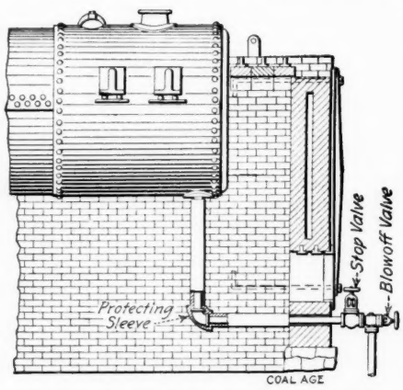


Fig. 4. Blow-off and Stop Valve

Feed Water Heating and Purification

The installation of a good feed water heater is always worth considering (1) because of the saving in fuel and (2) because it saves the boilers. Whether the open or closed type of heater should be selected, depends largely upon the conditions of service. The closed heater possesses the advantage that with its use oil cannot possibly be carried over to the boilers from the engine exhaust. On the other hand, if the water used contains salts which precipitate at a comparatively low temperature, the closed heater will soon become inefficient unless frequently cleaned, and under these circumstances it is usually advisable to install an open type heater, in which the salts can readily be thrown down and easily removed. In the latter case, oil in the steam may be taken care of by means of an oil separator.

The heater should usually be connected as shown in Fig. 6, that is, in a non-thoroughfare. This arrangement operates to prevent even the small amount of oil which may pass the oil separator from getting into the heater and consequently reaching the feed water. The amount of steam required for heating the water is usually only about one-fifth of the engine exhaust and this much will readily be drawn into the heater by the reduced pressure, which results from the condensation of the exhaust steam.

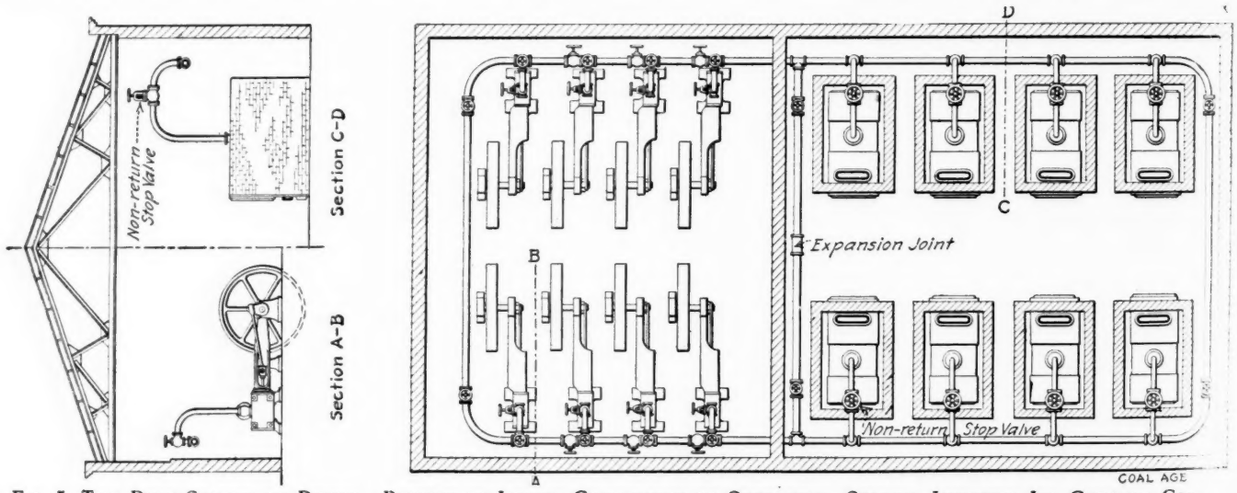


Fig. 5. The Ring System of Piping, Devised to Insure Continuity of Operation, Seldom Justifies Its Greater Cost

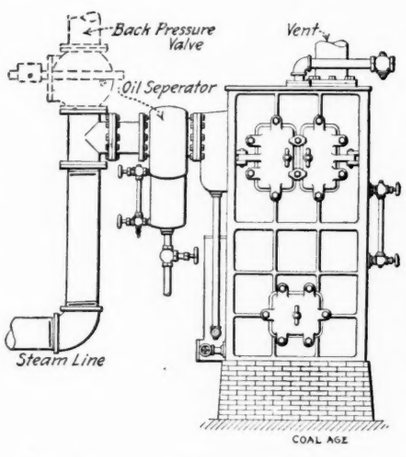


Fig. 6. Non-thoroughfare Heater

The Screening Problem in Illinois

By A. Bement*

An interesting review of the relative production of the different sizes in the Illinois fields. The results of a change in the methods of payment from a lump to a mine-run basis are graphically shown. The use of mechanical stokers by large consumers has materially strengthened the demand for the finer sizes and the author is inclined to the belief that these will eventually command the highest prices.

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The accompanying diagrams, Figs. 1, 2 and 3, show graphically the production of the various grades of coal in the state of Illinois. The output is shipped as mine-run, or prepared as lump, egg, nut and screenings, the latter mostly through 1¼-in. perforations. The output where division is made is more commonly separated into 1¼-in. lump, known generally as railroad coal, and screenings. In certain districts, however, notably the southern part of the state in Williamson, Madison and Macoupin Counties, a different separation prevails. The fine coal goes through a screen having 3-in. perforations and is then separated into five sizes which are washed and enter the market as washed and sized coal.

The Abrupt Decrease in the Production of Lump

Prior to 1898, lump coal was by far the principal product, as in the early days of mining there was very little demand for the fine sizes. Every effort was therefore made to produce as large a percentage of lump as possible and before the decrease in lump production occurred, just prior to 1900, as shown by Fig. 1, payment for mining was upon the lump coal basis. The drop in the curve illustrates the results of the change in the method of payment from the lump to the mine-run basis, which occurred at this time. Formerly, it had been to the advantage of the miner to produce as much lump coal as possible; with the mine-run basis of payment, however, this incentive was no longer present.

The result was the production of a very large tonnage in the form of screenings for which there was small demand and consequently they sold at a very low price; about 25c. per ton at the mine would probably represent the average. The rapidly increasing use of automatic stokers, however, gradually changed this condition by enlarging the demand for screenings to such an extent that the fine coal threatens to become the principal product, a condition just the reverse of that formerly existing.

The price of raw screenings, at the present time, is subject to great fluctuations. Within the past year, they have been as high as $2.38 and as low as 20c. per ton at the mine, with an average of about 85c. for the year. This great fluctuation in price is due to the supply being so variable, as screenings are only made when lump coal is being produced, and are thus limited by the lump demand. At such times as the supply of screenings is inadequate.

Relative Production of Sizes

Diagram, Fig. 2, illustrates the respective percentages of lump, screenings, mine-run and egg coals produced since 1900. From this it will be seen that from 1906 to 1909 there was a marked falling off in the production of mine-run, due largely to the increasing demand for fine coal. Since that year, however, the percentage of mine-run has increased rapidly up to the present time while screenings show a decline. This is because the demand for screenings so much exceeded the supply that it was necessary in a great many cases to purchase mine-run and crush it.

The effect of the increasing percentage of mine-run is also apparent upon the lump coal curve, while that of egg coal shows a steady but moderate increase. One of the factors influencing the production of egg is that it is found to be a most satisfactory size to place in storage, a practice which is gradually becoming more common in the territory tributary to the Illinois coal fields.

Diagram, Fig. 3, is based upon the data presented in Fig. 2, except that a division is made of the fine coal into raw screenings and washed coal. This shows that the production of standard stoker fuel, or in other words, raw screenings, was in 1911 very much smaller than mine-run, while the washed coal output shows a steadily increasing gain. This washed coal in the form of screenings and the washed sizes is largely used in hand-fired furnaces and domestic fires, although there is a certain amount used in stokers, where it is felt that a superior quality of fuel is desirable.

There is a marked tendency toward an increase in the demand and price of the smaller sizes; thus the washed sizes Nos. 4 and 5, the former ¼x⅝ in. and the latter that which passes through ¼-in. perforations are in larger demand than are Nos. 1, 2 and 3. If this condition continues, the small sizes will soon command a higher price than the larger. This reasoning applies to raw screenings also, and a time may come when they, as well as all of the fine coal, will bring a price higher than that obtained for lump. If this comes to pass, mine-run coal will be at a premium, compared with lump, and on a par with raw screenings. In fact, raw screenings may command a slight premium over mine-run, as it would be more desirable for a power plant to purchase screenings which are coal in a crushed form than to buy mine-run and crush it.

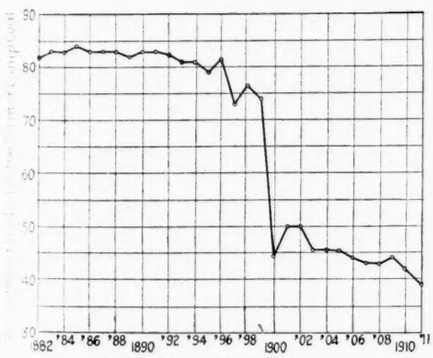


Fig. 1

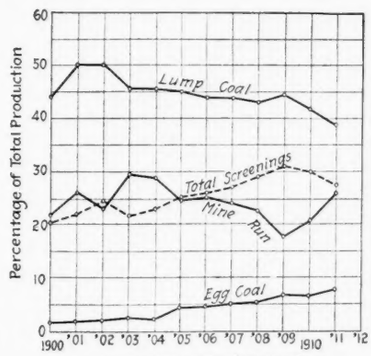


Fig. 2

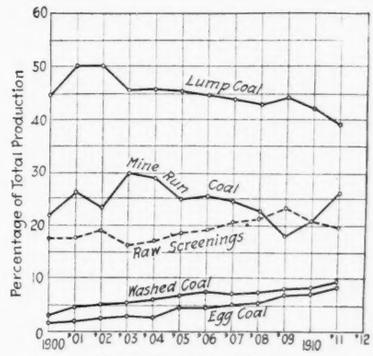


Fig. 3

PROFILES SHOWING FLUCTUATIONS IN PRODUCTION OF THE ILLINOIS COALS

The Hookworm and the Miner

By R. S. Ogilvie
and N. P. Brooks

It has been demonstrated in Germany that sanitary provisions can eradicate hookworm whether mines are dampened or kept dry. The authors declare that in omitting moistening to avoid ankylostomiasis, there is danger of replacing the disease by miner's consumption.

It is an indisputable fact that wet mines are much more widely infected than dry workings, but no one ever heard of an absolutely dry mine. We shall find a certain number of feeders in every underground operation of any extent and where we find them, if the temperature is suitable, the mine under the present lack of sanitary precaution will be almost sure to become infected with the larvæ of hookworm. The area of infection will be less but it will claim a certain number of victims each year.

A paper by J. Wroe (vol. 29, pt. 3, of the *Transactions* of the Institute of Mining Engineers) gives a few statistics as worked out by investigators for the coal mines of Germany. The following figures are the result of two years' study of the conditions in four German collieries. The Julia and Heydt mines are, in general characteristics, very similar. Both were dry mines and they had been sprinkled for several years in accord with the German law. By a special act all watering was stopped in the Julia while it was continued in the Heydt as before. At the same time, active treatment of the men and of the mine to eradicate the hookworm was begun in both. It consisted in treating all the feeders of water with milk of lime, in treating all the men infected and in, as far as possible, isolating the infected workers.

JULIA AND HEYDT MINES

Examination	Men examined	Men infected	Percentage
First:			
Julia	1168	228	19.52
Heydt	928	166	17.89
Second:			
Julia	1088	16	1.47
Heydt	928	20	2.15
Third:			
Julia	1063	10	0.94
Heydt	886	13	1.47

Throughout the time between the first and third examination prophylactic treatment of the mine continued. The first two inspections were separated by a time space of one year. The second and third examinations in the Julia mines were 18 months apart but in the Heydt mine only 17 months.

How Larvae Were Destroyed in Two Normal Mines

The Recklinghausen Collieries Nos. 1 and 2 were more or less wet and had never been watered. No. 1 had a steep pitch and was a crowded mine.

RECKLINGHAUSEN COLLIERIES
Mine No. 1

Examination	Men examined	Men infected	Percentage
First	1141	144	12.76
Second (after 12 months)..	1306	52	3.98
Third (after another 18 months)	1227	30	2.44
Fourth (after another 22 months)	1006	29	2.88

Mine No. 2

Examination	Men examined	Men infected	Percentage
First	1425	53	3.70
Second (after 12 months)..	1826	14	0.77
Third (after another 18 months)	1766	4	0.22

These statistics of the Julia and Heydt mines show that in the watered mine there was a slightly larger number of men infected than in the unwatered mine, but the percentage was so small that if a larger number of operations had been taken the results might show that the difference was due to other causes than the presence of moisture. We think it would be safe to say that when using due prophylactic measures, we can disregard the slight danger which exists of increasing the hookworm disease amongst the miners and can spray and drive steam into the workings as much as we consider necessary.

Our study of the question has brought us to believe that the temperature, pitch of the seam, and general working conditions will be found to influence the spread of the disease much more than watering the mines. The latter certainly can have no bad effects if the scheme which we are offering is carefully carried out from the start or is introduced into an old mine. The sure way to guard our miners from infection of the hookworm is to prevent the mine soil from becoming infected with its larvæ.

Life History of the Worm

There seems to be no intermediary host necessary for the development of the parasite. The ovum is passed into the feces and there develops into larval form. It then reënters the human body and grows to an adult worm. The mode and route of entry are still under discussion but the majority now accept the theory that the larvæ enter through the skin, usually through the skin of the feet. The problem then is how to keep the ova from reaching the mine floor and if they are deposited thereon how to prevent their development to maturity.

One of the first things on the ground when a new shaft is to be sunk should be some form of sanitary to be used by all men employed in sinking. The form which we recommend is an incinerator, the McCaul being quite satisfactory as it will take care of a large quantity of material and is fitted with a privy cover.

As the work progresses there should be furnished stout galvanized-iron cans of 10 to 20 gal. capacity, each can being furnished with a tight-fitting privy seat which can be easily removed when the can needs emptying. As the work progresses and entries are opened up with accompanying working places, new cans should be installed as fast as needed in such places as will be easily accessible to the employees. When possible the cans should be set in the return air way. We would recommend the use of a sufficient number of sanitaries so that men in charge of the work can make one collection daily, replacing the used cans with others which are empty and sterilized. The privy cover can be transferred to the fresh can, an ordinary tight tin cover being placed on the full can while it is being taken to the surface.

Incineration

The incinerator building should be placed as near the exhaust shaft as possible and should be a sufficient distance from the intake shaft to prevent the gases from the burning excreta entering the mine. There should be a large steam chest into which the exhaust steam from the hoisting engine can be turned.

On bringing the cans to the surface they should be emptied at once into the incinerator, then placed in the steam chest and the steam turned on. The cans should remain there for several hours, the duration of the steaming being dependent on the amount of steam which is available. After cooling, if the cans need any further cleansing, it can safely be done anywhere with a hose or by some other means.

One Man Can Care for All Sanitary Needs

The expense of such a method should not be great. One man can easily look after the cans in a large mine or in two small mines if they are close together. The residue makes a good fertilizer and the use of it will nearly pay the running expenses of the incinerator. It will be hard at first to get the men to use the cans; but if the pit bosses and under-bosses insist, the change can be easily effected and there will not be any of these evil smelling, nasty places which are to be found in nearly every mine and the hookworm will no longer infest the intestines of the miners.

Diseases of Respiratory Tract

It is well not to lose sight of one danger in guarding the men from another. In every dusty mine a great deal of disease of the respiratory tract is found. Anthracosis or miner's consumption is more common than the hookworm disease, though it is not as serious an ailment. A dry mine would probably increase the number of sufferers from anthracosis, at least as much as it would decrease the number of hookworm patients.

Throughout an old mine the feeders should be thoroughly treated with milk of lime weekly. Men known to be suffering from the disease should be isolated as far as practicable and should be warned that they are a source of danger to their fellow workers.

Firing Shots in Still Air

By John Verner

No conclusion of value can arise from a comparison of explosions in different mines, when complete descriptions of these are not available. But some scientific deductions are permissible when two explosions occur in the same mine. By considering only manifestations in identical workings, the argument seems favorable to shooting in still air.

*Chariton, Iowa.

Mr. Rhys, state mine inspector of the 2d Iowa district, in his review of my paper on Iowa mine explosions[1], in the May 11 issue of Coal Age, after citing a number of explosions in different Iowa mines, occurring with the fan running at its usual speed, reduced speed, or stopped entirely during shot-firing time, presents his conclusions that slowing down the fan before touching off shots does not lessen the force of the explosion, nor make it less destructive, and that the evidence is decidedly against my theory.

Fan Speed and Ventilation

Even a cursory reading of Mr. Rhys' article makes it evident that the above conclusion cannot have any value, because it is based solely on the unessential matter of the fan's speed at different mines where explosions occurred. He does not give any consideration whatever to the actual condition of the ventilation and other influential factors existing in these mines when they exploded. At one mine the fan may be run at top speed, and yet the ventilation of the working places may be objectionable and the current feeble; at another mine the fan may not be running at all, and yet through the force of natural ventilation the working places may be found adequately ventilated and with a fair air current passing through them.

Some years ago, I found at the bottom of the downcast of a certain old mine, an entering air volume of 11,500 cu.ft. per min., with the fan running at 88 revolutions. After this old mine was closed down, the fan was placed at a new plant and produced 36,000 cu.ft. of air per min. at the reduced speed of 62 revolutions.

Supposing it had been possible under the adverse conditions existing in the old mine to produce a feeble explosion in its working parts, and supposing that under the favorable conditions prevailing in the new mine a disastrous and violent explosion had occurred there, would that justify the assumption that the difference in fan speed was a factor in determining the mildness of the explosion in the old mine and the great violence shown in the new?

To prove or disprove that an increase or decrease of draft tends to increase or decrease the violence of explosions, it is necessary that the tests to that end be made in the same mine and under otherwise identical conditions, or in consequence too many undetermined considerations will vitiate the results.

The opportunity for making such tests was afforded by the two explosions cited by Mr. Rhys, which occurred in mine No. 4 of the Cleveland Coal Co., on Jan. 5, 1901, and on Feb. 5 of the same year. I am well acquainted with all the features of these explosions, because I investigated them personally immediately after their occurrence. Mr. Rhys states correctly that the two explosions started in the same part of the mine and almost in the same place, that otherwise similar conditions prevailed and that their course was identical.

Two Cases and But One Differential

There was, however, a marked difference in the effects. While the primary cause of the first explosion was apparently of greater power than that of the second, the second explosion showed much greater violence than the first as it extended toward the shafts. I was unable to discover any visible signs to account for this difference in effects, but I did find that the mean temperature on the day of the first explosion, Jan. 5, was 27.5 deg., and on the day of the second explosion, Feb. 5, 5.5 deg. Supposing that on both dates the fan was running at the same reduced rate of speed, it will be readily apparent to one conversant with the subject of mine ventilation that a drop of 22 deg. in the temperature of the air entering a mine means a considerable increase in the velocity of the air flow through the workings, and I can say that under the favorable conditions existing in No. 4 mine, this natural ventilating force became particularly effective, and consequently the draft facilities at the second explosion were materially better than at the first. Accepting Mr. Haas' rule that the magnitude of a dust explosion is measured by the availability of the air supply, other conditions being the same, the cause for the greater violence shown in the second explosion is reasonably accounted for.

The Belief of the Shotfirers

Mr. Rhys says: "Since 1902, the practice of slowing down the fan at firing time has become quite general throughout the state. Whether right or wrong, the belief in its protective value is such that it would be almost impossible to secure shotfirers in new mines, especially during the cold season, unless the fan was stopped or slowed down at firing time." Is it probable that such general and persistent belief can be founded solely on imagination? As a rule, the Iowa shotfirer is a man of intelligence and good judgment, and well trained in his hazardous work.

His daily opportunity to observe results under varying conditions enables him to become a competent judge as to whether the conditions found tend toward safety or lead into danger. When, after a test of ten years, he still declares his belief, that the reduction of draft at firing time is beneficial, his judgment should be received with due respect and consideration, especially in the absence of any proof showing that it is at fault.

Slowing the Fan at Least a Palliative

There is no direct proof that the practice of slowing down the fan at firing time has prevented the occurrence of an explosion in an Iowa mine. As a palliative, it has been and is now considered useful, but its greatest merit lies in the fact that its general trial in this state for ten years has brought to the Iowa shotfirers and many miners the firm belief, strengthened by personal observation and experience, that although ample and thorough ventilation is desirable and necessary, it brings with it an element of danger that demands careful consideration in providing for a mine's safety. That belief should be implanted in every mining community in this country.

[1] See "Causes of Iowa Mine Explosions," by John Verner, Feb. 3, 1912; Vol. 1, pp. 545-547.

West Virginia Coal Mining Institute

The ninth semi-annual meeting of the institute will be held in Charleston, W. Va., June 6, 7 and 8. A program has been arranged as follows:

Thursday, June 6, 10 *a.m.*—Address of welcome, by Gov. William E. Glasscock; president's address, by Frank Haas; five-minute talks by the vice-presidents; "The Use of Gasoline Motors in Coal Mines," by A. J. King, mining engineer, Charleston, W. Va.

2 *p.m.*—"Quality and Quantity of Mine Air," by Karl F. Schoew, mine inspector, Fairmont, W. Va.; "Points of Interest in Mine Ventilation," by J. T. Beard, associate editor COAL AGE, New York, N. Y.; "Successful Store Management in Relation to Mining Communities," by Charles H. Lantz, general manager, Buxton & Landstreet Co., Thomas, W. Va.

8 *p.m.*—"The Projection and Development of a Mining School," by E. N. Zern, professor mining engineering, West Virginia University, Morgantown,; "Mine Accidents and Their Prevention" (stereopticon), by Ira D. Shaw, international secretary Y. M. C. A., Pittsburgh, Penn.

Friday, June 7, 10 *a.m.*—"Coal Mine Accidents," by David Victor, chief mine inspector, Consolidation Coal Co., Fairmont, W. Va.; "Safety in Coal Mines, Especially in West Virginia," by F. C. Cornet, mining engineer, Charleston, W. Va.; "Some Experiences in the Drainage of Mines," by C. E. Tucker, superintendent, Consolidation Coal Co., Frostburg, Md.

2 *p.m.*—Trip to the Blue Creek oil fields, 15 miles from Charleston, on the Coal & Coke Ry. Special train will leave Charleston at 2 p.m. and return at 5:30 p.m.

8 *p.m.*—Banquet at Hotel Ruffner, Toastmaster: Gov. William A. McCorkle. Speakers: Hon. George E. Price, "Railways and Coal"; Hon. Malcolm Jackson, "Laws"; Hon. Henry G. Davis, "Pioneer Days"; Dr. J. A. Holmes, "Scientific Research"; Dr. I. C. White, "Geology"; Hon. L. E. Tierney, "Practical Mining"; J. C. McKinley; Hon. Z. T. Vinson; Frank Haas, "Institute Work"; Hon. George S. Laidley, "Education"; Dr. J. E. Robbins, "Village Sanitation."

Saturday, June 8, 10 *a.m.*—"Lubrication," by L. A. Christian, consulting engineer, Keystone Lubricating Co., Pittsburgh, Penn.; "Required Qualifications of a Successful General Manager, from a Superintendent's Point of View," by T. H. Huddy, general superintendent, Boomer Coal & Coke Co., Boomer, W. Va.; question box; reports of committees.

The sessions will be held in the Senate room of the State House, at Charleston.

Coal Mining Institute of America

The summer meeting of the institute will be held in Johnstown, Penn., June 25 and 26, and will be devoted to a discussion of practical mining problems. The institute headquarters will be at the Crystal Hotel and sessions will be held in Library Hall. The following program has been arranged:

Tuesday, June 25, 10 *a.m.*—Address of welcome, by C. S. Price, president, Cambria Steel Co. President's address, A. W. Calloway, general superintendent, Rochester & Pittsburgh Coal & Iron Co. Business session. Symposium: Weak links in the operating chain, (a) executive officers, (b) mine superintendents, (c) mine foremen and assistants.

1:30 *p.m.*—Continuation of morning program. Question box, State Mine Inspectors Nicholas Evans and T. W. Williams presiding. The afternoon session, from 3:30 o'clock on, will be devoted to the discussion of practical questions submitted by members of the institute.

6 *p.m.*—Institute dinner. Toastmaster: H. S. Endsley. Speakers: John Fulton, C. C. Geer and Frank Gray.

Wednesday, June 26, 9 *a.m.*—First-aid demonstration and contest, in charge of Thomas B. Dilts, mining secretary, Pennsylvania State Y. M. C. A., and Harvey J. Hill, special secretary, Y. M. C. A. Judges: J. A. Metzgar, M. D., Latrobe, Penn.; F. C. Keighley, Uniontown, Penn.; H. M. Wilson, engineer in charge U. S. Bureau of Mines, Pittsburgh, Penn.; F. W. Cunningham, state mine inspector, Charleroi, Penn.; A. C. Beeson, chief engineer, Pittsburgh-Buffalo Co., Pittsburgh, Penn. The Coal Mining Institute of America will award an engraved silver cup to the winning team.

12 *Noon*—The Cambria Steel Co. will tender a complimentary luncheon to members of the institute and a sight-seeing trip has been arranged. The party will be taken by special train through the mills and works of the Cambria Steel Co.

If the institute so decides an evening session can be held in Library Hall. Charles L. Fay, Wilkes-Barre, Penn., is secretary-treasurer. M. G. Moore is chairman of the committee on local arrangements.

Alabama Coal Operators Association

The annual meeting of the Alabama Coal Operators Association is to be held at Birmingham, June 11, at which time officers will be elected. The annual outing of the association is to be held June 12, at the Docena mines of the Tennessee Coal, Iron & R.R. Co. near Birmingham.

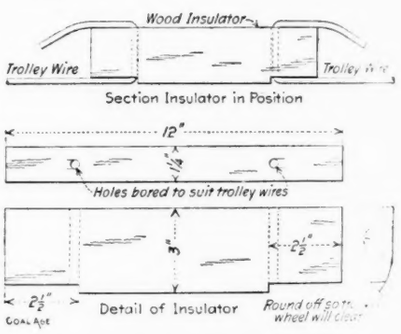
Among the speakers who will address the meeting will be Dr. S. C. Hotchkiss of the U. S. Health and Marine Hospital Service; Morris Knowles, sanitary engineer for the association; Dr. Robert Nelson, city health officer, and H. M. Wilson, chief engineer of the U. S. Bureau of Mines.

An interesting feature of the outing will be an exhibition of mine machinery, safety appliances, mine lights, permissible explosives, rescue apparatus, fire proofing, brattice cloth, etc.

A Home-made Trolley Wire Section Insulator

BY ARTHUR O'BRIEN

A section insulator for coal-mine trolley wires, can readily be made from a stick of oak or maple, as shown in the accompanying illustration. Although insulators of this type are simple in construction and cheap to make, they have shown themselves to be thoroughly reliable in every-day service around the mines.



TROLLEY WIRE SECTION INSULATOR

Maple is the best wood for the purpose, but oak is frequently used, because it is more likely to be available around mining plants. Where it can be done, it is a good plan to boil the stick, after it is worked into shape, in paraffin, or to paint it with an insulating varnish that will soak into the wood. The only advantage that appears to come from this treatment, is that moisture, which might in time split the wood, is kept from entering it. The device gives quite satisfactory service without treatment of any kind.

The dimensions given in the sketch are approximate, and may be varied within reasonable limits to satisfy local conditions. The length, however, should not be much less than 12 inches.

When installing the device, care must be taken to so bend the trolley wires that it will stand vertically. Experience has shown that merely turning the ends of the trolley wires over, as shown in the illustration, provides sufficient support for the insulator. The trolley wires should be supported by an insulating hanger and clamp at points a few feet away on each side of the section insulator.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Explosion Prevention by Oxygen Reduction

The prevention of explosions by a reduction of the oxygen content of the mine air was recently advocated by J. Harger in a lecture before the Geological and Mining Society at Manchester University on Feb. 27.

In the course of the lecture, Dr. Harger stated that neither a candle nor a lamp would burn in air in which the oxygen was reduced to 17 per cent., yet a man could work continuously in such an atmosphere and not observe or feel any difference in his condition from the reduction of oxygen. No shortage of oxygen was noticeable until the reduction reached 14 per cent., while at 12 per cent. the shortage was most marked, and at 7.5 per cent. life was extinguished.

Dr. Harger said that air containing 17 or 18 per cent. of oxygen, with a moderate amount of carbon dioxide up to 1 per cent., was entirely suitable for the human requirements and was as good as ordinary air. A man breathing atmospheric air (21 per cent. oxygen) exhaled a mixture of gases containing 16.5 to 17 per cent. of oxygen and 4 to 3.5 per cent. of carbon dioxide. The reason this was expelled was not because more oxygen could not be taken by the lungs, but, because the depth and frequency of breathing were unconsciously regulated to keep the carbon dioxide within the lungs at 5.5 per cent. The slightest increase in the carbon dioxide was sufficient to excite the nervous center, which regulates breathing, to increased activity.

To prevent explosions, Dr. Harger suggested the taking of flue gas, purified from all harmful ingredients, the mixing of them with fresh air entering the mine workings in the proportion of one part to 30 of fresh air or one part to 15 for the most dangerous mines.

In the discussion which followed, the colliery managers and engineers took a prominent part, and they argued that there is often a great difference between laboratory tests and conditions in extensive workings. What effect would the reduction of oxygen have on workings far removed from the shafts? Must we unlearn all that we have learned about ventilation and the need for a maximum percentage of oxygen? Dr. Harger in reply stated that on the first application he would reduce the oxygen to 20 per cent. in ordinary mines, while in the dangerous mines he would reduce it to 19 per cent.

Precise Surveying for a Connection

By Frederic C. Noble*

Every coal engineer, at some stage of his career, is called upon to "make a survey connection." These connections are most often of some important haulageway, and it is essential that the results be comparatively accurate. This paper describes the ultimate refinement in work of this character as applied on one of the most important engineering projects of the day.

Note—Abstract of a paper (copyright) presented before the American Society of Civil Engineers (New York), Feb. 7, 1912. The paper is entitled, "Notes on a Tunnel Survey," by Frederick C. Noble, and is published in the December issue of the "Proceedings" of the Society (p. 1302).

*Division Engineer, Public Service Commission for the First District, 23 Flatbush Ave., Brooklyn, N. Y.

The following is a description of the surveying methods used in constructing the tunnel under the East River (at New York) between South Ferry, Manhattan, and Joralemon St., Brooklyn. This tunnel was begun in March, 1903, and was opened to traffic in January, 1908. The tunnel consists of two parallel single-track tubes, of the usual cast-iron ring construction having an interior diameter of 15½ ft. The distance between centers is 28 ft. under the river and 26 ft. in Joralemon St. The Manhattan headings were driven from a double shaft in Battery Park. The Brooklyn headings were driven from two shafts (one over each tube) in Joralemon St., about 1200 ft. from the water front. Between the shafts, a distance of about 6000 ft., there are three tangents in the tunnel line, the middle or river tangent being joined to the Manhattan and Brooklyn tangents by curves of 4500 ft. radius (Fig. 1).

The intersection of the south tube lines of the Joralemon St. tangent and the Manhattan tangent produced was located on the roof of a dock warehouse at the foot of Joralemon St. It was necessary to determine the exact distance between this intersection and a point of known stationing on the south tube line in Manhattan and this required a triangulation survey. It was apparent that no base line of suitable length could be laid out in the vicinity that could be measured directly from end to end as one of the sides of the triangulation system. Although the ends could be located on roofs, so as to be seen from each other, the measurement had to be made along a broken line.

The Triangulation System

A reconnaissance showed that a suitable base, about 3000 ft. long, might be obtained on the Brooklyn waterfront north of Joralemon St. The southern end of the base chosen was the above-mentioned intersection of the south tube lines. Its northern terminus was also located on the roof of a warehouse. Each of these points commanded a view of the other and of the adjoining waterfronts of Manhattan and Governor's Island, and, accordingly, were suitable for triangulation stations. In Manhattan, because of intervening buildings, it was found impracticable to locate a triangulation station on the south tube line in the vicinity of the shaft so that it would be visible from all the other stations. On this account two elevated points on the roofs of near-by buildings, one on each side of the Manhattan tangent, were chosen as triangulation stations, and carefully referenced to the point of known stationing on the south tube line, which was visible from them. On the northerly sea-wall of Governor's Island, two triangulation stations were chosen which marked the extremities of a shorter base used two seasons before in making a preliminary triangulation of the tunnel line. It was desired to include this base in the system so as to have an independent check on the measurement of the Brooklyn base.

The foregoing arrangement gave four fairly well proportioned quadrilaterals, the Brooklyn base forming one common side. In the system there were no angles of less than 26° or more than 78°, and the ratio of length of base to the distance sought was about 1:1½. By having four

quadrilaterals from which to calculate the coördinates of the Manhattan points, referred to the Brooklyn base as the axis, it was thought that any material error in the angular work could be detected, and this would give a measure of the error to be regarded as unavoidable.

Measuring the Base Line

The base line traverse was measured with a 50-ft., flat, steel-wire tape, provided with a spring-balance handle containing a level bubble, thermometer, and adjustment for temperature correction. It was marked with nicks at each end for use with plumb-bobs. The tape was tested for absolute length by comparison with a standard tape of known error, as determined by the Bureau of Standards at Washington. Measurements were made on cloudy days, or during early mornings in the shade, to secure uniform temperature conditions. The line was marked in advance every 50 ft., and paper pads, ruled with a longitudinal line, were weighted down at these points, so as to relieve the head chainman of the distraction of getting line from a transit. Each measurement was made by simultaneous plumbings at the ends of the tape, which was held level. The forward point was marked at the average of a number of trials. For each series of measurements a fresh sheet of the pad was used. With a tape of this kind the difficulty of steady and precise plumbing was such that no individual measurement could be depended on to less than 0.003 ft., or 1 in 17,000.

No doubt a better method consists in using a longer tape, supported at short intervals, with a tape-stretcher; and measuring directly, without plumbing, on portable stations, as was done later in connection with other tunnel surveys in New York. However, with care, it was found that the errors were not cumulative, and, in a distance of 2880 ft. measured in this way, the variation between the mean and the greatest extreme of several measurements was only about 1 in 100,000. The ends of the line measured on the docks were connected to the triangulation stations on the roofs in two different ways, in order to avoid repeating an error. The points on the copings were transferred to the dock level by casting down intersecting lines of sight from three transit set-ups. As a further check, an independent traverse, closing on the same points, was run by a different party in the marginal street back of the warehouses, and this gave a result agreeing with the dock traverse to 1 in 150,000.

Instrument Work

The triangulation sights were octagonal pine poles, 2¼ in. diameter and 8 ft. high, painted in alternate bands of red and white. These could be bisected readily, and gave no sensible difficulty from phase, because of the comparatively short range and the cloudy weather selected for instrumental work; but it would have been better practice to use higher targets with wide, flat vanes, set alternately at right angles.

The angles were read separately by two observers, with different instruments. These were ordinary engineers' transits, reading to 20 sec. on a 6¼-in. limb. The eight angles of a quadrilateral were measured separately by successive additions upon the limb. The entire angle at a station was also read, as a check on the sum of its components. To avoid bias, the angles were started at random near zero. Turnings were made, accumulating from left to right, until the sum became as nearly as practicable 360°, or its multiple. Reversing the telescope, and setting on the right-hand target, the same number of turns was made from right to left until the sum was diminished to near the original reading. Both verniers were read at the beginning, at the middle, at intermediate points, and at closing. In case an angle failed to close nearer than an average of 4 sec. to each turning, the result was discarded and the angle was read again.

When the third angle of any triangle of the system had been read, the angles were added, and if their sum varied from 180° by more than an average of 5 sec. for each angle, the three angles were read again. The quadrilaterals were tested in like manner. It was found necessary to read over only one triangle, and in this case the trouble was located at a station where the conditions for observing had been less favorable than elsewhere.

In comparing the observed angles, it was noted that the direct reading of an angle was generally greater (by 2 or 3 sec.) than its value as found by taking the difference between two angles; and that, at the end of an observation, the closing reading was nearly always greater than the first. As this pointed to a small persistent error, it was seen that it would have been a better program to measure each angle both directly and by its 360° complement, and to take the mean.

Computing and Checking the Triangulation

The set of observed angles of each quadrilateral was adjusted by the method of logarithmic residuals, based on the principle of least squares, according to Johnson, and using the rigid method of making the side equation correction. The angles read by each observer were adjusted separately. The corrections for spherical excess and reduction to sea-level were omitted as insignificant.

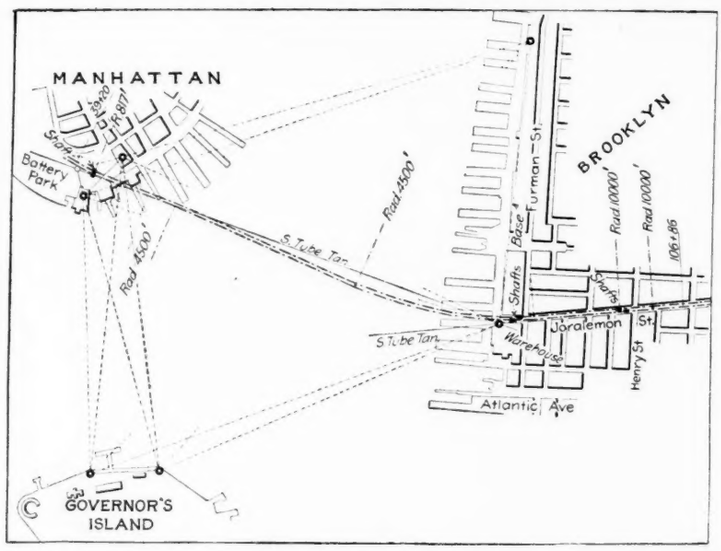


FIG. 1. PLAN OF TRIANGULATION SURVEY FOR THE EAST RIVER TUNNEL FROM THE BATTERY (NEW YORK) TO BROOKLYN

The four quadrilaterals formed four pairs, each with a common triangle. These relations would give rise to additional equations of condition, and the simultaneous adjustment of all four quadrilaterals would be possible, theoretically. However, this was not attempted because the refinement would not pay for the effort, and because it was desired to compute each quadrilateral separately adjusted, so as to gain a practical idea of the effects of error in the angular work.

For the purpose of comparing results, the coördinates of the Manhattan and Governor's Island stations, referred to the Brooklyn base, were then computed for each of the four adjusted quadrilaterals of each observer. On plotting to full size it was found that for any point the various positions thus computed fell within the section of the target pole. It was seen that considerable time and labor would have been saved (and with sufficiently accurate results) by using any one quadrilateral, but the advantage of

learning in this way the probable extent of errors from all causes was thought to warrant the extra trouble.

The sides of the triangle formed by the two Manhattan triangulation stations and the point of known stationing in Battery Park were then measured, and the coördinates of the latter point were computed from those of the other two. The distance triangulated for was then determined. The computed length of the Governor's Island base (about 700 ft.) was found to agree with its original measured length within 0.016 ft., or much less than the probable angular error would account for.

The stationing of the Brooklyn intersection of the south tube tangents then being known, base-tape measurements were made from this point to the Brooklyn shafts. Stationing was transferred to the tunnel by plumbing in the shafts. All measurements, above and below ground, to determine stationing in the tubes, were made with the same kind of tape as that used for measuring the base, and in a similar manner. When the first headings were connected, the measured distance was found to be about 0.02 ft. short of that calculated. The discrepancy was somewhat more than had been expected, but may be adequately accounted for as combining the error in angular work with the error due to the difference in conditions, with the apparatus used, between taping in the tunnel and taping the base line on the surface. Its effect on the results of the surveys for alignment and grade, however, was very slight.

For establishing the Manhattan tangent alignment, there was no point on line in Battery Park, near the shaft, that was high enough to afford a sight to Brooklyn over the intervening ferry houses. For this purpose, two towers, about 35 ft. high, one on each tube line, were erected about 150 ft. west of the shaft. From these it was possible to look across the river over all obstructions and see targets on the warehouse roof in Brooklyn set on the Manhattan tube lines prolonged. The towers were built as triangulation towers usually are: with an interior tripod of three 8x8-in. timbers rigidly bolted together at the top and braced. This was inclosed within, but nowhere touching, a four-post tower braced on all sides and supporting a platform for the observer a little below the top of the tripod.

Plumbing the Shafts

Line was transferred to the tunnel in the following manner: A transit, mounted on a trivet, was set on the tower tripod on the tube center line, as plumbed up from a hub under the tripod by several reversals of another transit set on the center line a short distance away. The tower transit, fore-sighting on the Brooklyn target, set (by repeated plungings) a point on center line on the surface, about 10 ft. beyond the shaft. On this point a transit was set up, with its plumb-string in the mean position of the several settings; then, fore-sighting on the plumb-string of the tower transit, it aligned two plumb-wires suspended in the shaft.

Steel piano wire, 0.02 in. diameter, was used for this purpose. It was wound on brass reels 9 in. diameter. The reels were set, with their axes across the line, on stringers attached to the head-frame posts, high enough to permit sighting on the wire and to fore-sight by merely changing the focus. As the wire left the reel it ran over a small grooved wheel on a threaded axis, turned with a thumb-screw, by which slow lateral adjustment could be given. The wire was kept taut by a 20-lb. weight suspended in a pail of water at the bottom of the shaft.

The wires were shifted laterally until the vertical hair exactly bisected the plumb-string fore-sight and both plumb-wires. When this condition was reached, a transit set up in the tunnel below (as close to the wires as practicable) was shifted laterally until its vertical hair exactly bisected both wires. Then reversing, it threw the line forward, setting two or more plummet-lamps hung from verniers reading on graduated brass scales attached to the roof of the tunnel. Resetting on the wires, another set of readings was taken. Two more sets were taken in like manner with telescope reversed. The wires were then shifted and reset by the upper transit, and the previous operations were repeated for four more sets.

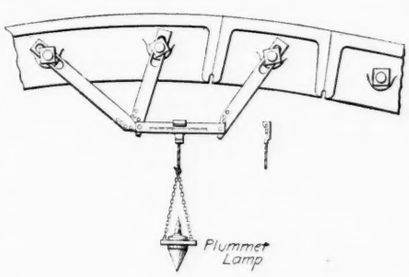


Fig. 2. Scale for Alignment of Tunnel

The whole of the foregoing operations was then repeated, after interchanging transits at top and bottom, turning the water pails containing the weights partly around, shifting the wires, examining them to see that they hung free, and interchanging the members of the party. This work of plumbing the lines down the shaft was usually done on Sundays, when the cages were not running.

The base between the wires was about 10 ft. at the Manhattan shaft and 15 ft. at the Brooklyn shafts, and in each case was as long as permitted by the width of the shaft. On account of the shorter base in Manhattan, and the extra operation there in transferring line, opportunity was taken, when the headings were afterward extended west from the shaft, to check the line by plumbing through a vertical 6-in. pipe sunk from the surface to the tunnel at a point on the center line of one of the tubes, about 130 ft. from the shaft.

Method of Aligning

The alignment scales were brass bars, 1 in. wide, ¼ in. thick, and 10 in. long, graduated to 0.01 ft. They were connected by three flat iron bars to the bolts of the tunnel lining at the roof (Fig. 2). The scales were read to 0.002 ft. by a sliding vernier from which a plummet-lamp was suspended.

The line established on the scales near the shaft, as the mean result of many days' droppings, was produced by repeated runs read on scales set at intervals of about 200 ft. These runs were made by different observers, and using different transits, until mean readings were well established on the advance scales. Where the tube was on a curve, the scales were placed on tangents as long as could be obtained, and usually near points of intersection. The angles at these points were carried forward by repeated turnings on the forward scales.

When it became necessary to carry the line through a lock, the transit was placed on a trivet on a timber wedged across the lock at the forward end, where it had the support of the bulkhead wall. It was then lined in with the last two scales, the forward one having been located as close as practicable to the lock, and a reading was taken on a paper scale set inside the lock over the outbord door. The lock was then taken in, and, before throwing the line ahead, the paper scale was read again to detect any possible movement due to change in pressure. No trouble was ever experienced on this account, however, and when the bulkheads were advanced the lines thus locked through checked quite satisfactorily with lines carried through in free air.

To assist in aligning a transit with two given points, a very useful device was furnished by the instrument maker. This consisted of two sliding plates, which were attached between the transit base and the tripod head or trivet, and permitted considerable range of lateral movement by a slow-motion screw.

Giving Level Points for Grade

Grade was established between the two sides of the river as follows: Level runs were made from the shafts on each side to benches under the Brooklyn Bridge on the river side of each tower, at which point the river is much narrower than at the tunnel line. Levels were set up on each side, and simultaneous reciprocal readings were taken a number of times. The instruments were then interchanged and the readings repeated. In this manner errors due to refraction, curvature, and imperfect adjustment were compensated.

Who's Who—in Coal Mining

Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

In the conduct of a great industry like coal mining, which requires the services and time of nearly a million men in the United States alone, there must be all kinds of individuals to handle the diversified work in hand. It is necessary that thousands of humans labor in the dark depths mining and loading coal; other thousands oversee the manual work and direct the physical effort of the mass of workers along intelligent lines; a smaller number of men control expenditures and pass on the plans formulated to secure efficiency in operation. All of these people, whether workmen or officials, are directly connected with the production of coal, and are specified as being in the operating end of the business.

There are other lines of endeavor, however, that bear a direct relation to coal mining, and which are absolutely essential to the successful advance of the industry, although the effort put forth cannot be measured in tons of output. These latter workers are the teachers and thinkers who spend the greater part of their time in the compilation of facts and the manufacture of ideas for the operating end to test out. It's the old, old story of theory as related to practice, and the futility of any effort based on either one, without reference or attention to the other. If all the brains of our industry lay centered in the strong arms of the sturdy toilers who mine the coal, the business as a whole would soon reach a sorry pass. But on the other hand, if all the strength needed to get the fuel out of the ground was mental horsepower, the final outcome would be no less disastrous.

We have written a number of sketches of prominent men actively engaged in the production of coal, and it is about time that something is said concerning the teachers and thinkers who work just as diligently and as effectively for the good of the industry. Few men are more widely known to coal people than H. H. Stoek, who has devoted most of the working hours of his life to the mental betterment of the men engaged in the coal business.

After graduating from the High School in Washington, D. C., in 1883, Professor Stoek entered Lehigh University, South Bethlehem, Penn., graduating in 1887 with the degree B. S. in Mining. He spent the following year doing post graduate work, for which he received the degree E. M. (Engineer of Mines).

H. H. STOEK

During the summer of 1885, while yet a student, Professor Stoek acted as assistant in the Department of Mineralogy, at the National Museum in Washington. During the summer of 1887 he filled the position of Government Inspector of Dredging Work on the Thames River, Conn. From June 1888 to January 1890, he was assistant engineer for the Susquehanna Coal Company, Wilkes-Barre, Penn., being engaged in surveying, general underground and office work.

In January, 1890, H. H. Stoek accepted a position as Instructor in Mining, Metallurgy and Geology at Lehigh University. From September 1893 to January 1898, he acted as Assistant Professor of Mining and Metallurgy, Pennsylvania State College. During the vacation months, while teaching at Lehigh and Pennsylvania State College, much time was spent in personal investigations and professional work. Among other things, a report was made upon iron properties in western North Carolina.

From January 1898 to 1908, Professor Stoek served as editor of *Mines and Minerals*, Scranton, Penn. During this time he visited most of the mining regions of the United States, making a careful study of the coal mines in practically every district, together with visits to the metal mines of most districts, excepting those on the Pacific Coast. This work was done in the interest of his paper, and the results of his investigations in the different fields were published from time to time.

Professor Stoek's editorial experience has not been confined solely to his work for *Mines and Minerals* but has covered a broad field of activities, which included the editorship of the "Coal and Metal Miners' Pocketbook," Fulton's "Coke," "Examination Questions for Certificates of Competency in Mining," and Lake's "Prospecting for Gold and Silver," also a number of volumes on coal mining comprised in the complete course of the International Correspondence Schools.

He is author of the chapter on "The Economic History of Anthracite," which forms a part of "The Economic History of the United States," being gotten out by the Carnegie Institution of Washington, D. C., under the general editorship of E. W. Parker. "H. H." was also in charge of waste in mining anthracite for the United States Geological Survey, when the Bureau of Mines was created. His work along this line was never completed because of the change in administration when the Mining Bureau was formed.

During the time that he was engaged in editorial work, Professor Stoek gave a number of special lectures on mining at Cornell University, Pennsylvania State College, Sheffield Scientific School and the Brooklyn Polytechnic Institute. On leaving *Mines and Minerals* in 1909 he again took up educational work, having been appointed Professor of Mining Engineering at the University of Illinois.

Since locating in Illinois, "H. H." has taken an active part in the development of first-aid and mine-rescue work. He is a member of the Illinois Mines Investigation Commission; secretary of the Rescue Station Commission; member of the First Aid Committee of the National Red Cross, and was special representative of Governor Deneen at the American Mining Congress last year. He is also a past president of the Coal Mining Institute of America, and in addition to his present duties as Professor of Mining, is engaged in an extensive co-operative investigation of the coal-mining industry of Illinois, in connection with the State Geological Survey and the United States Bureau of Mines.

During the past two or three years, Illinois has made more rapid progress in the matter of first-aid and mine-rescue work than any other state in the Union, and much of this advance has been due to the well directed efforts of Prof. Stoek.

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Of this issue of Coal Age, we will print 5000 copies. No copies will be sent free regularly. There will be no back numbers. The figures shown here each week represent live, net circulation.

This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

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COAL AGE

The Hookworm

Every little while comes the suggestion that ankylostomiasis is likely to become chronic in American coal mines, as a result of the entire absence of sanitary precautions. There seems little danger of its general prevalence, however, until we begin to exploit coal beds much deeper than those which are worked at the present time.

We await with interest what the Bureau of Mines may have to say about the *ankylostoma duodenale,* the nematode which is colloquially known as the hookworm, or hairworm, and which is somewhat different from the hookworm of the South, though quite closely allied.

The Bureau and Marine Hospital Service of the United States have been investigating the matter, and state that "the hookworm has been found as a miners' disease in a number of different localities of the United States." "It is," the director of the bureau remarks, "important that the work of investigating the progress of the disease should be extended more rapidly, because of the fact that the health conditions, as well as the risk of accidents, may be influenced by conditions susceptible of easy improvement."

It is this extract from the report made to the President, which alone justifies the discussion of the disease in this coal journal, for the malady does not seem likely to menace the American coal worker, and should normally escape reference in these columns. The disease is the result of the ravages of a worm which infests the human intestines and feeds on the human blood. The female of the species lays some millions of eggs.

These eggs ungerminated pass out of the human body in the feces, being prevented from development by the internal heat of the digestive organs (96 deg. F.), and by the absence of air. The ova will not germinate at any temperature exceeding 86 deg. F., nor will they develop when they are excluded from the atmosphere.

According to a report made by Sir Cecil Hertslet to the British government, based apparently on observations by Dr. Herman, the ova of the ankylostoma may be transformed into worms if the temperature where the feces are deposited exceeds 57 or 59 deg., and is less than 86 deg. F.

Dr. Stiles, however, in the famous bulletin 10, issued by the Hygienic Laboratory, suggests that at the lower limit the action of germination is slow and feeble, for he says that: "At a temperature of 79 deg. F., the embryo may form and escape from the shell in 24 hours. Lower temperatures retard development, so that at 70 or 72 deg. F. the embryo may not escape for 36 to 40 hours." He has, however, nothing to say about the germination at such a low temperature as 57 or 59 deg. Fahrenheit.

A mine, therefore, which is warm is likely to favor the development of the germ. If, however, the mine is cooler and quite moist, it is probable that both coolness and moisture will destroy it. While yet an egg, or even in the first stage of its development, as a living worm, the growth of the ankylostoma is retarded by the presence of moisture; much water will actually kill the eggs. But in the second stage of its multiform life, it takes kindly to water, and the worms have been kept in that medium for 30 days by A. Looss, without loss of activity.

Hence, in a cool mine, where the fetal development is slow and the air moist enough to cause the feces to deform and flow, the environment for the germinating worm must be distinctly unfavorable, especially when the temperature lengthens the time of hatching, enough to permit the mass to deliquesce. And in a hot mine, like some of our deeper metal mines, dry as is an oven, the germ will be killed by the heat, and should it reach the second stage of development, it will be killed by drying up.

The danger is greatest, therefore, in mines of temperatures from 70 to 86 deg. F. The average drift mines are not usually so warm, unless they pass under unusually heavy cover. In several West

Virginia mines, even though steam is used in the intake to moisten the air, the heat of the workings does not anywhere exceed 59 deg., though the covering strata aggregate nearly 600 ft. But in shafts of the Middle West, temperatures rule high and records have been taken, showing 60 to 78 deg., and doubtless equally high temperatures may be found in the anthracite mines.

In these latter the disease may possibly take hold, but even there the risk is small, for it appears that the egg of the worm does not hatch out in the open air of England, Belgium, France or Germany, and temperatures there are as favorable as in the shafts of Illinois or northeastern Pennsylvania.

There the disease is present in the mines ready to spread to the surface. The eggs are continually coming to daylight, transported by a half dozen different media—water, coal, the clothes and bodies of the men and their feces, etc. Some of the habits, that of wearing clogs, should make the spread of the worm easy. Nevertheless, in northern Europe the ankylostoma is purely a miners' pest; it does not attack his family.

We can understand, perhaps, why the hookworm does not extend northward from the Carolinas, Georgia and Florida, because an exposure to 34 deg. F. for one or two days will destroy the ova. Consequently, the disease could only spread in the north through the mines, which it seemingly cannot invade. But in northern Europe, it already has made the mines its habitat. The workings act as winter incubators, and the whole of the out-of-doors will serve for hatcheries in the summer if the summer temperatures of those countries be favorable. That anemia, cachexia and pyrosis do not affect the outdoor workers of northern Europe must be because the conditions for incubation in those countries are not favorable enough that such incubation can generally take place even in the summer months.

From this fact we draw no little hope, confident that hookworm will not be a vocational disease of miners in any extended measure, but we still look forward with much interest to what will undoubtedly be the conservative statements of the Bureau and the Hospital Service. Our mines are getting deeper and therefore warmer, so perhaps this scourge is truly to be feared.

The Pittsburgh Rate Case Again

The coal operators have never before faced a more callous or stubborn attempt at usurping their rightful prerogatives than that exhibited in the stand taken by the railroads in the Pittsburgh-Lake rate case. While technically within the letter of the law, the skillful subterfuge by which the roads evaded complying with the manifest intent of the Commission's rulings, is so obvious as to warrant prompt and vigorous action by the government.

It is clearly evident that the carriers regard the efforts on the part of the coal industry to obtain some control over the markets as a presumption which they will oppose on every conceivable ground. The very magnitude of the case gives it a particular significance, also the fact that it will doubtless be quoted as a precedent in all future rulings of a like nature. For this reason the decision will be bitterly contested by the railroads.

Practically coincident with establishment of the new Pittsburgh rate, the carriers put in effect a lowered tariff on the West Virginia product which to all intent and purposes completely nullified the decision of the Commission. Thus the differential condemned by the Commission and that reëstablished by the railroads in lowering the rates from West Virginia were, respectively: Pocahontas and Tug River district, 33¼c. against 34c.; Thacker and Kenova district, 18¼c. against 19c.; Fairmont, 8¾c. against 12c. Not only were the findings of the Commission rendered void, but a still more pronounced differential against the Pittsburgh operators created.

That these machinations of the roads were premeditated and the way paved for their successful consummation is not to be questioned. Both the Norfolk & Western, and the Baltimore & Ohio, during the course of the original hearing, requested the Commission to sanction an increase in the rate prevailing at the time. This was apparently a mere sham since, after vigorously maintaining the necessity of such an advance, they not only declined to establish it, but the latter road went even further by making a reduction.

The Commission found, in its ruling in this case, that the carriers had established the then existing tariff "in order to let certain competing coal fields into the Lake trade," and when fixing the new differential said further:

> In arriving at this conclusion we are not unmindful of the fact that these rates may deprive the shippers from the Pocahontas and Thacker (Kenova) fields, along the line of the Norfolk & Western, of their present market.

It is thus clearly evident that the basic intent of the Commission's ruling was the establishment of a new differential. That they refrained from making this even greater may be ascribed partly to the testimony of the carrier's chief witness, who swore under oath that: "In his opinion, when that differential is fixed it will be observed until the lines in interest can get some permission from proper authorities for changing it." And partly to his statement that a conservative estimate of the tonnage that would be affected would be 60 million tons per annum, exclusive of that directly involved in the Boileau case.

If such testimony as this could be given any weight, the Commission displayed an entirely justifiable conservatism in the differential upon which they decided. But since subsequent developments have proved conclusively that this testimony is not to be relied upon, and the railroads have insolently ignored the decision of the Commission, it appears that the time has arrived when it should either justify its existence or be dissolved.

Under the Mines Act of Great Britain, the workmen are empowered from time to time to appoint two of their number, who are practical working miners, to inspect the mine. The persons so appointed must be allowed (accompanied by the manager or one or more officers of the company) to go to every part of the mine and inspect the shafts, levels, planes, working places, return airways, ventilating apparatus, old workings and machinery. Every facility must be afforded for the examination and a signed report of the result of the inspection has to be recorded in a book, kept at the mine for that purpose. Should the report state the existence or apprehended existence of any danger, the manager is required to cause a true copy of the same to be sent to the mine inspector of the district. This privilege is today being more generally taken advantage of by the men.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Standards in Coal Washings

I was very much pleased to note the comments in the May 25 issue of COAL AGE, referring to my article in *Mines and Minerals*, on "Standardization in Coal Washing."

I hope I will not be misunderstood in this matter as it was not my object in publishing those data to make the claim that my method of determining washery efficiencies was the only one that could be employed. I have made a careful study of this subject for a number of years and have long felt the need of some method of actually determining the efficiency of a coal washery. I have often heard the term "efficiency" used in connection with coal washing but have never read anything that would indicate, nor have I been able to get others to state, in just what sense they used this term. In fact, I have never known anyone to state that a 65% or a 90% efficiency had been obtained, but in the use of the term, it is always referred to as a "high" or a "low efficiency."

There are several reasons why I feel that my method is a good one. One is that, by the use of my formulas, every item of a test can be checked and nothing assumed. This in my opinion would indicate that the method is along the proper lines at least. Another is that, as you mention, the separations are made in an exactly similar manner to that which must be employed in the actual washing of the coal. There may be some rare cases where the refuse matter is lighter than the good coal but in such cases the float would be considered as refuse and the sink as coal. My formulas could still be used in such cases by rearranging the terms to suit the conditions. Other rare cases might be found where the refuse material and coal were of the same specific gravity, but that is just the point I wish to emphasize as the valuable part that the float test plays in checking up the work done by any washery. For is it not true that, were such a difficulty met in the float tests, and a separation of the impurities from the coal impossible, it would also be impossible to obtain a separation on any form of washing machine, since they all depend upon a difference in the specific gravities to make their separation?

Some claim that in making float tests a number of gravities should be used so that the coal sample will be separated into good coal, bone coal, slate, rock, etc. I have done this same thing at times though I cannot see that such data have any great value. In washing coal, one first determines just how high a percentage of ash can be permitted for the particular proposition in hand. For instance, in a coking proposition where 14% ash is absolutely the limit for the coke, and experiment has shown that an 11% ash coal will produce 14% ash in the coke, there is no object in producing a washed coal of a lower ash content than 11%. Of course, if a 12% ash coke will sell better or for a higher price, and the loss by refuse in producing a lower ash washed coal does not amount to more than the increased profit of the 12% coke over the 14%, then a 12% coke should be made and the coal washed to suit. It is therefore seen that one must first determine the *limit* of ash content before anything else is done and everything therefore is based upon that figure.

What must be known is, how much bone coal can be thrown with the low ash coal and not raise the ash content of the washed coal above the limit placed upon it. For instance, if the low ash coal (say everything below 1.35 sp. gr.) has an ash content of 8%, and the bone coal 15%, and our limit is 11%, how much of the 15% ash product can be mixed with the 8% ash coal to produce a final product having an 11% ash content?

By separating out all of these different grades as mentioned, and recording their percentages and their ash contents, such data could be calculated. But it is easier and quicker to simply run a series of float tests for the raw coal as suggested in my article and in this way determine at once just what specific gravity bath will produce a float coal of the desired ash content. This, then, is what I term the "permissible bath" and is used for all tests on that coal, or the refuse and washed coal from it.

There is just one point upon which I have been a little in doubt and have as yet been unable to find any satisfactory solution. As stated before, a limit must be placed on the ash content for every separate proposition and as this limit would vary to a considerable extent, it might seem to make it impossible to compare the results of the work performed by different plants on exactly the same basis. Still, I find that this does not make a very great difference and in fact I have about come to the conclusion that it has no effect at all as the efficiencies in every case are based upon the comparison between the actual separation as obtained by washing, and the perfect separation as obtained by the float test. This, I find, seems to eliminate the apparent error as, for instance, a jig of one type producing 60% efficiency on one coal as against a 70% efficiency of another type of jig on another coal, the latter will also only produce about a 60% efficiency on the coal the other machine is working on.

There is another item to which I wish to call particular attention. I have found that very few engineers make float tests of the washed coal, the refuse only being tested. It is very important that such tests be made on the washed coal also, for if there be any pieces of refuse matter, particularly pieces of the very high ash slates, etc., present in the washed coal, they tend to raise the ash content much more rapidly than would a greater quantity of lower ash bone coal. In coking propositions they also have a very detrimental effect on the coke which is not produced by a larger amount of the bone coals, as they act as heat absorbers instead of creating any heat in themselves and will cause greater cross-fractures and fingering of the coke. It is therefore desirable that there be no incombustible pieces in the washed coal and that the float tests of the washed coal should be taken into account in determining the total efficiency. Also, whenever there is any sink obtained from the permissible bath test of the washed coal, it will be found that the percentage of washed coal is lower than it should be, as determined by the permissible bath test of the raw coal.

I do not think I need add anything further to that portion of my paper treating upon the subject of loss of "good coal" in the refuse, or as to what constitutes "good coal." That which I have just discussed regarding the mixing of as much bone coal as possible with the low ash coals covers this matter fully, for, most certainly, any coal, whether bone or low ash, which was floated on the permissible bath in the raw coal tests is "good coal."

I hope those interested in this subject, and who care to take up the discussion in the columns of your journal, will first study carefully all the data presented in my paper and consider it from all angles, as I have found it a matter which cannot be decided upon hurriedly. I am most certainly willing and glad to

change my views if anyone brings forth a better method or will show wherein I am wrong. I do not consider a plain statement all that is sufficient, but think the reasons should be given and, if possible, a better way suggested. I hope my paper may result in bringing out some ideas that will facilitate the adoption of a standard method of calculating washery efficiencies and make it possible for all engaged in this branch of engineering to understand one another more clearly. The standardization of the form of report would also, I feel sure, greatly assist the coal-company officials to understand more thoroughly the work being done by their washeries and make it possible to more accurately compare these results with those of other companies.

G. R. DELAMATER,
Consulting Engineer.
2357 Cherry St., Denver, Colo.

Purification of Feed Water

I have noticed the following statements occurring in recent issues of COAL AGE; namely, in the last paragraph, p. 804, Mar. 30, " . . . . and the sulphates are precipitated by soda ash"; and again, in the second paragraph, p. 1002, May 11, "Moreover, the soda-ash solution, which removes the sulphates, chlorides, etc."

The author of these statements makes it appear that the sulphuric acid of the sulphates in the water treated, is precipitated by the soda ash as sodium sulphate, and thus readily removed from the feed water. My experience in the soda-ash treatment of mine water fails to corroborate these statements of your correspondent. In treating a permanent hard water with soda ash, the reaction may be expressed by the following simple equation:

$$RSO_4 + Na_2CO_3 = RCO_3 + Na_2SO_4$$

in which "R" represents the basic metals combined with acid. The resulting salts are carbonates of "R" and sulphate of sodium. The carbonates are precipitated and can be easily removed from the water by settlement or filtration; while Na_2SO_4 being a soluble salt, is not removed from the water by these methods. The soda-ash treatment simply causes a transformation of the sulphates of all other metals into sodium sulphate. The advantage in the process lies in the fact that sodium sulphate is easily soluble in water and does not form scale in the boiler. The hard scales formed on the plates and tubes of boilers consist chiefly of sulphate of lime, etc., which adhere very firmly to the boiler plates. The formation of such material in a boiler is detrimental to the economic operation of a plant, since it is a poor conductor of heat; and the rate of combustion must be increased, which causes overheating of the plates and tubes of the boilers.

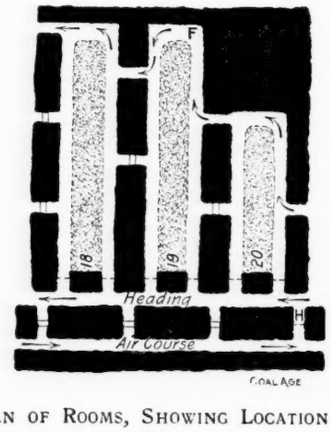
Wilkes-Barre, Penn. H. H. L.

[The sulphuric acid existing as sulphates in mine water is best removed by treating the feed water with barium hydrate, $Ba(OH)_2$; or limewater (slaked lime) $Ca(OH)_2$; and the resulting barium or calcium sulphate is precipitated with the basic hydrates formed.—EDITOR.]

A Mine Fire Incident

The recent discussion on mine fires in COAL AGE calls to mind an incident that is of value, as showing the need of greater intelligence and experience on the part of mine officials.

At the close of the day's work, a miner fired a shot that presumably started a fire in room No. 19 off the 4th left-butt entry. The room was a double room, having two necks or openings, with a road on each side of the room, and was driven 175 ft., on a 2-per-cent. upgrade. There was a crosscut half way up, between rooms 18 and 19, and another on the opposite side, between rooms 19 and 20, about 60 or 70 ft. from the face of room 19 and in the face of room 20. The accompanying diagram or plan shows the position of the three rooms, Nos. 18, 19 and 20; the location of the fire marked *F*, at the face of room 19; direction of the air currents in the entries and rooms, indicated by the arrows; etc.



PLAN OF ROOMS, SHOWING LOCATION OF FIRE

The fire was not discovered until the fireboss, making his rounds the next morning, entered the 4th-left heading and found it so filled with smoke that he could not proceed. He retired at once to the 3d-left air course or entry and made his way through a manhole marked *H* in a nearby brattice, to the 4th-left heading. Seeing smoke coming out of room 19, he went up room 20, and looking through the crosscut at the face, discovered the seat of the fire, which was evidently beyond his control. Returning to the surface, a mile or more, he notified the mine foreman, who, with the mine engineer, went in at once, reaching the fire about 6 a.m.

After a brief consultation, they decided to flood room 19 by building a dam in the crosscut between 19 and 20, and another in the neck of room 19. This was Friday morning. Except for two or three entries on the return of the fire, the mine worked all day as usual. The foreman ordered cement and other material taken in to the fire, intending to build the dams of concrete made of cement and broken coal, egg and nut size. The work of getting the material in readiness took all day, and at six o'clock Friday evening, nothing had been accomplished in extinguishing the fire.

The heat thrown out by the burning coal was now intense, which caused a big cave at the face of room 19. For several days past, the miners in this room had thrown back their surplus coal in a pile. This coal was burning under the fallen roof, which covered it about 5 or 6 ft. deep. The mine foreman seemed at his wit's end to know what to do. The engineer and about a dozen men were there waiting for some one to tell them what to do.

Finally, the foreman sent for an old, experienced miner, who had worked before in putting out fires. This man came and looked at the fire and asked the foreman what his plan was for putting it out. The miner told the foreman at once he could not "drown out" the fire as he expected, because of the crosscuts beween rooms 18 and 19. The plan was, therefore, promptly abandoned, and the miner, being given charge, soon had things moving.

Men were now set to work propping the fallen roof. A brattice was carried up the neck of room 19, as far as possible, hoping to reach the crosscut, and thus form a return for the air current, to prevent it from passing over the fire. This proved successful and a canvas was hung then in the heading, between rooms 19 and 20, to throw the air up room 20, where it would return through the crosscut to the road in 19. This gave the men a fighting chance, enabling them to approach sufficiently close to the fire to do effective work. Soon a good stream of water was playing on the fire. Men relieved each other every 20 or 30 min. Progress was slow but sure. The fire was fought inch by inch till Saturday noon, when it was under control, and by Monday morning the fire was a thing of the past.

Republic, Ala. G. T. M.

H. B. Dixon has shown that an explosion is impossible in an absolutely dry atmosphere, and that mixtures of air and explosive gases require 5 per cent. of water vapor to produce the most violent effects.

Inquiries of General Interest

Questions are not answered unless accompanied by the name and address of the inquirer. This page is for you when stuck—use it

Squeeze in a 3-ft. Seam of Hard Bituminous Coal

I would like to obtain some information on the best method of working a 3-ft. seam of very hard coal, underlaid with from 6 to 14 in. of soft fireclay, which runs into a hard muck or clod. The cover overlying the coal varies from 40 to 300 ft. in thickness. Immediately above the coal is a hard slate overlaid with sandstone forming a hard cover that is difficult to break.

We are using the double-entry system. The rooms are driven as double rooms, having two necks to each room. There is a 20-ft. stump left between each neck or opening. The mine is an old one, having lots of worked-out territory. I wish to know if there is any way of stopping a squeeze in this mine when once started. I will be glad to give any further information if desired.

J. S. FREEMAN.

Corona, Ala.

A hard roof and soft bottom in coal mining are the most difficult conditions with which the miner must contend. A strong roof that does not break is a great temptation to drive wide rooms and the pillars left between them are often too weak to support the great weight thrown upon them by the extraction of the coal. To mine a seam of coal successfully, it is necessary to adopt and maintain a system of mining in accordance with the conditions as they exist. Practical experience in the district is always the best guide in determining the safe width of opening and the required thickness of pillars in room work.

In this case, assume the room necks are each 10 ft. wide, and the stumps between the necks being 20 ft. wide makes the clear width of the room 40 ft. For a hard bituminous coal 3 ft. thick, the strength of the pillars (tons per square foot) may be taken as, approximately,

$$S = 40\sqrt{\frac{w}{t}} = 40\sqrt{\frac{w}{3}}$$

The average weight of the strata is 160 lb. per cu.ft., which for a maximum depth of 300 ft. gives a roof pressure of

$$\frac{300 \times 160}{2000} = 24 \textit{ tons per sq.ft.}$$

By the taking out of the coal in the rooms, however, the pressure per square foot due to the weight resting on the pillars is increased in the ratio $\frac{w+o}{w}$ which makes the actual pressure on the pillars $24\ \frac{w+o}{w}$ tons per sq.ft.

The minimum width of pillar is then found by equating this value for the pressure on the pillars with the value for the strength of the pillars, S, found above; thus,

$$40\sqrt{\frac{w}{3}} = 24\frac{w+o}{w}$$

But, since $o = 40$ ft., we have, by reducing,

$$5\sqrt{\frac{w}{3}} = 3\frac{w+40}{w}$$

and

$$w = 1.08\left(\frac{w+40}{w}\right)^2$$

The value of w, in this equation, can only be found by trial. For example, try $w = 20$; then

$$\frac{w+40}{w} = \frac{20+40}{20} = 3$$

which, substituted in the last equation, gives

$$w = 1.08 \times 3^2 = 9.72$$

This being lower than the assumed value shows the true value of w is between 9.72 and 20. Therefore, try $w = 15$, then

$$\frac{w+40}{w} = \frac{15+40}{15} = \frac{11}{3}$$

and, again, substituting this value in the above equation, we have

$$w = 1.08\left(\frac{11}{3}\right)^2 = 14.5$$

The true value is therefore between 14.5 and 15; or, say the required width of pillar is 15 ft.

In this case, if *all* the entry stumps are 20 ft. wide, the room necks being 10 ft. wide, are driven on 30-ft. centers. This makes the width of the rooms 40 ft. and the width of pillars between the rooms 20 ft., which would certainly be ample, in this case.

If these assumptions are correct, the trouble from squeeze, mentioned by our correspondent, can only be the result of maintaining too large an open or abandoned area. The method employed is a good one. The hard roof would not permit longwall work, which but for this fact would be the plan to adopt.

Assuming the squeeze is under way, having obtained a good start, no amount of timbering will control or prevent its steady advance. The weight of the overburden is bound to travel forward until it meets a sufficient resistance for its support. A careful study of the mine map, on which should be marked exactly the affected area and the extent of the workings, will suggest the best plan to adopt in order to arrest or control the squeeze.

The plan adopted after studying the map, should consider: 1. The withdrawal of all standing timber in abandoned places. 2. A systematic drawing back of any room pillars that will divert or arrest the progress of the traveling weight. Experience is required to determine this. 3. It will be necessary to adopt means to break the roof in many places, by placing shots at suitable points in the roof. The effect of this plan will be to settle the weight on a solid bearing.

In this reply, we do not consider preventive measures, but have only outlined a method for the arrest of a squeeze already in progress. In this connection, the reply to the inquiry entitled "Methods To Be Adopted To Avoid Squeeze," COAL AGE, Mar. 9, p. 719, will be of interest.

Early Coal Cutting Machinery

Can you tell me something about the early coal-cutting machines and the nature of their operations?

Du Bois, Penn. MINING ENGINEER.

Little seems to be known and to be on record relative to the early advances in the use of coal-cutting machines for undermining coal. The first patent appears to have been taken out in 1761 by Michael Menzies. He proposed to transmit power from an engine at the surface through a series of reach rods and chains passing over pulleys to a machine carrying a heavy pick, which was to undercut the coal. To drive these reach rods he proposed to use a "fire engine, a water miln, a wind miln, or a horse gin." By a fire engine he doubtless meant what we would now call a steam engine.

In the century following Menzies' invention more than a hundred patents were taken out having the same object. In one of the Lancashire collieries in 1847 a machine was erected by W. Story, of Gateshead. About that time or a little later the purely experimental stages of the history of "the iron man" may be said to end and the more practical stages begin.

FIRST MACHINES IMITATED THE MINER

Fig. 1 shows an early form of coal-cutting machine. The illustration is

taken from Knight's American Mechanical Dictionary, Vol. 1, pages 580-581, published in 1877. Like many early illustrations it is in perspective and there is some difficulty in understanding the purpose and character of some of the parts illustrated. Consequently the reader will only be able to form a general estimate of the methods adopted for the effecting of results.

We quote the description verbatim from the aforesaid dictionary, in order to preserve certain quaint expressions and to illustrate some of the unreliable hopes which the early inventors held or desired to inspire in others:

"One form of the coal-cutting machine has an engine with a reciprocating piston driving a massive steel pick in any desired direction and at a very material saving in hewing or kirving. The motor-power is highly compressed air, condensed by the steam engine at the mouth of the pit and this elastic air is conveyed by slender pipes down the shaft and

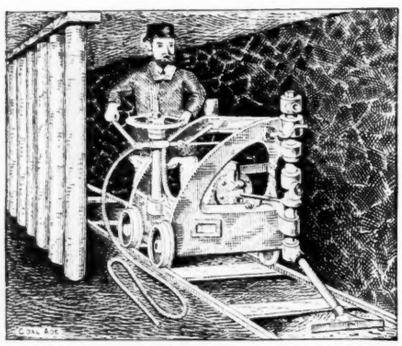


FIG. 1. AN EARLY COAL CUTTER

along the mines to the breast where the coal is being worked.

"The compressed air is pumped by the steam engine into a receiver at the pit-head during the otherwise idle hours or by its surplus power when drawing up the coal or pumping out the water from the mine and is condensed to a tension of forty to fifty pounds to the square inch.

AIR RELEASED IS EXPECTED TO VENTILATE WORKINGS

"It is conducted in metallic pipes 4½ in. in diameter down to the bottom of the shaft and thence in pipes of smaller diameter to the workings, tubes of 1 or 1¼ inch caliber bringing it to the cylinder of the machine. This compressed air, when set free at each alternating stroke of the piston, imparts to the adjacent portions of the mine a pure dry, cool atmosphere, from a well known law of all air and gases that when expanded under relaxation of pressure they are relatively cool.

"The machine is supported by a cast metal frame of great solidity, and is of a size and weight proportioned to the coal to be cut. It is constructed to give the blow of the pick, either by the pull or push of the piston. The engine has an oscillating cylinder which has the merit of combining compactness of shape with but little complication of working parts.

"The machine rests upon flanged wheels and is propelled either backward or forward by a wheel and screw on a ratchet and pinion attached to one side of the engine. On the opposite side is a valve screw for regulating by hand the access of air to the engine. When working, the man seated upon the little stool in the rear of it moves the ratchet-screw connected with the gearing of the under-carriage, and thereby propels the whole machine along the little railway or tram laid parallel to the front of the coal seam, a small distance equal to the longitudinal nip or bite of the pick.

MACHINE IS REQUIRED TO TRAVERSE BREAST THRICE

"One machine, working 90 blows of the pick per min., discharges, of condensed air, about 100 cu.ft. per min., which immediately becomes 300 cu.ft. of cold air at the normal density and each machine is competent to supply from 12 to 15 per cent. of the ventilation required at the heading; the air being perfectly fresh, pure and cool and afforded precisely at the localities where the workmen are most in need of such atmosphere. When working at 120 picks per minute, the machine cuts an inch at each stroke 20 inches deep, 2½ inches wide; a second traverse deepens it to 30 inches and a third to 36 inches."

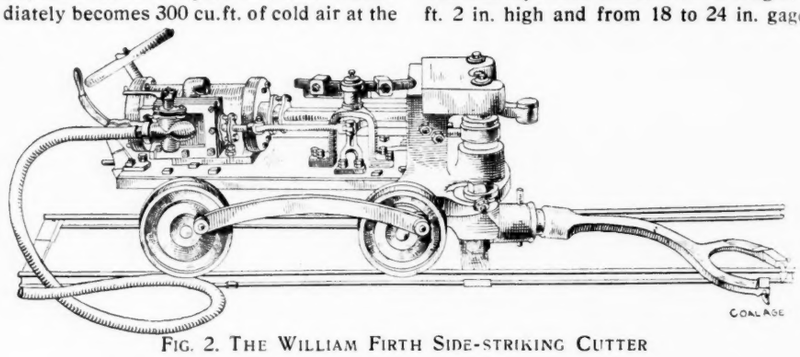


FIG. 2. THE WILLIAM FIRTH SIDE-STRIKING CUTTER

FIRTH'S MACHINE CROSSES FACE BUT ONCE

In Fig. 2 is shown Wm. Firth's coal-cutting machine. He was a native of Sheffield, England. Like the preceding coal cutter, it appears to have been run in front of the face or breast of coal on a pair of rails and to cut on the side instead of on the end as with our modern punchers. Like all the successful early machines, it was operated by compressed air. At the rear end was placed a horizontal cylinder in which a piston reciprocated, the rod of which extended forward and operated a pair of bell cranks pivoted on two revolving spindles in the front of the machine.

These bell cranks each terminated in a socket provided for the insertion of a heavy pick. Each pick had two points, but instead of these being at either end of a straight bar, they were disposed on the end of what resembled the claw of a lobster, so that both could strike on the same coal face. They are so set, however, that one is cutting near the front of the cut and the other near the rear. Thus by one motion of the machine past the face, it is possible to cut to the full depth of 36 inches. It is clear that as the machine had two bell cranks and two revolving spindles it was possible to work the pick from either side, that is, either right or left handed.

PROVISIONS FOR MOVING ALONG FACE

As in the machine previously illustrated, it was thought necessary to provide a miter wheel, shown at the back, for its propulsion in front of the face, and further in order to aid its progress, the four wheels were coupled in pairs on either side of the machine. The cutter was usually made about 4 ft. in length, 2 ft. 2 in. high and from 18 to 24 in. gage, and weighed about 1680 lb. It made about 60 to 90 strokes per min. and so cut from 10 to 20 yd. for a depth of 3 ft. in every hour; even at the lower rate of working, the machine cut 60 yd. in every shift of 6 hr., and the work was considered equivalent to that of 12 average men. The cut thus made was much similar to that made now by a chain machine, being 2 or 3 in. deep at the face and finishing to 1½ in. deep at the back.

Before the last machine was introduced a form of chain-cutting machine had been in use, invented by William Peace, in the Wigan district. This chain-cutter frame did not enter the coal by a sumping cut, as do our machines today. It was pivoted in such manner that it could be turned toward the face at an angle and when once it had made a quadrant cut in the coal it could be worked forward on the short-wall principle. Winstanley and Barker later invented a disk cutting machine; in working, this machine also made the first cut by the use of a swivel arrangement. The disc could be thrown around so as to be along the line of the track when making a sumping cut.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Interesting Questions

(Answered by Request)

Factors of Efficient Ventilation

Ques.—What are the chief factors necessary to secure efficient ventilation in mines?

Ans.—There are three chief factors that are essential for the efficient ventilation of every mine. 1. A sufficient quantity of air must be conducted into the mine to comply with the requirements of the state mining law. 2. The volume of air passing into the mine must be divided and distributed to the several districts of the mine in proportion to their several requirements. 3. All of the air entering the mine must be conducted to the working face by means of substantial stoppings, air-tight doors, air bridges, brattices, etc. It is important that the air current should be made to sweep all void or abandoned places and falls, with a velocity sufficient to carry away any gases that would otherwise accumulate at these points.

Water Gage *re* Horsepower

Ques.—If 10 hp. is producing a circulation of 60,000 cu.ft. of air, in a certain mine; what is the water gage?

Ans.—

$$H = \frac{Q\,p}{33{,}000}; \text{ and } p = \frac{33{,}000\,H}{Q}$$

Therefore, for the water gage, in this case, we have,

$$w.g. = \frac{p}{5.2} = \frac{33{,}000 \times 10}{5.2 \times 60{,}000} = 1.058\ in.$$

Ques.—If 10 hp. produces a certain water gage, in a given mine; what water gage will 25 hp. produce, in the same mine, under the same conditions?

Ans.—For the same conditions in the mine, the water gage varies as the square of the quantity of air in circulation, and the power varies as the cube of that quantity. Hence, for the same conditions in the mine, the square root of the water gage and the cube root of the power each vary as the quantity; or they vary alike, the one as the other.

In other words, the square root of the water-gage ratio is equal to the cube root of the power ratio. The question does not give the original water gage; and, for this reason, it is only possible to find in what ratio the increase of power, from 10 to 25 hp., will increase the water gage. Thus,

$$\sqrt{\frac{(w.g.)_2}{(w.g.)_1}} = \sqrt[3]{\frac{25}{10}} = \sqrt[3]{2.5} = 1.357$$

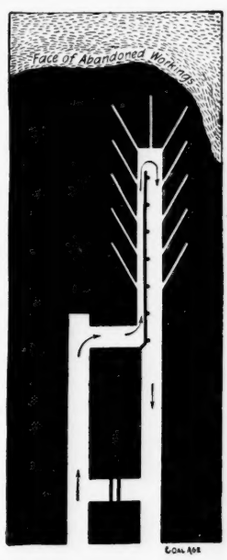
$$\frac{(w.g.)_2}{(w.g.)_1} = (1.357)^2 = 1.84$$

That is to say, increasing the power from 10 hp. to 25 hp. will increase the water gage 1.84 times.

Precautions Approaching Abandoned Workings

Ques. — Explain what precautions should be taken when approaching abandoned workings that may contain dangerous quantities of water or gas.

Ans.—In this case, no reliance should be placed on the mine maps although these may be made from accurate surveys. A slight error in the map or the survey might prove fatal. Only a single heading should be driven, not over 12 ft. wide. This must be ventilated by erecting a brattice to conduct the air forward to the face of the heading, as shown in the accompanying figure.



Heading Approaching Abandoned Workings

A borehole should be kept at least 20 ft. in advance of the face of the heading and flank holes should be drilled, at regular intervals, not more than 5 or 6 yd. apart, on each side of the entry. These flank holes should make an angle of about 30 deg. with the center line of the heading, as shown in the figure.

A sharp lookout should be kept for the first signs of water or gas. Plugs should be kept in readiness to stop the hole if it should suddenly break through into the old workings. Safety lamps, only, should be used. The heading should be well timbered.

Outbursts Of Gas

Ques.—What are the causes of sudden outbursts of gas when mining coal? How are they manifested and what precautions should be adopted in mines subject to such occurrences?

Ans.—Sudden outbursts of gas frequently occur in gaseous mines and are the result of the accumulation of gas under pressure, in pockets or foliations of the strata. As mining proceeds the strength of the walls or confining strata is insufficient to resist the great pressure of the gas, which finally bursts its bonds, throwing down tons of coal or roof in its effort to get free.

Outbursts are often heralded or their approach manifested by severe "poundings" or "knockings," which are sometimes heard for days in advance of the occurrence.

When mining under these conditions the precaution should be taken to sink large boreholes, from the surface, ahead of the workings, for the purpose of draining off the gas from the area soon to be worked. Holes are also bored in the face and ribs of entries to relieve the pressure of the gas on the coal. When the gas occurs in the roof or floor, holes are likewise put up in the roof or down in the floor of the seam, with good effect. Rooms and headings are driven less wide and are securely timbered as experience dictates.

Furnace or Fan Preferred

Ques.—When and under what circumstances are furnaces to be preferred to fans for ventilating purposes?

Ans.—Although a fan is always more reliable as a mine ventilator and requires less attention, in its daily operation, there are still some who prefer a furnace. The use of the furnace, however, should be restricted to the ventilation of small mines having shafts not less than 75 to 100 yd. deep, and producing no gas. Even then it is more economical and advantageous in many ways to replace the furnace with a good fan as early as the development of the mine will warrant making the change. In a nongaseous mine where the seam lies very deep, say 250 yd. below the surface the furnace is an efficient means of ventilation.

Sociological Department

For the Betterment of Living Conditions in Mining Communities

Navigation Co.'s Underground Hospital

The rescue and first-aid work in the anthracite region has the proper spirit. It is fostered and financed by the operating companies, but there is no question but what the men are interested and cooperating, and are willing to contribute to its development and support.

The fine underground hospital we illustrate here and on our front cover confirms this fact. The Lehigh Coal & Navigation Co. built the hospital, but the men spent $150 in the furnishing of it. It is situated 980 ft. below the surface in No. 8 shaft of the Coaldale colliery, near Lansford, Penn., and is excavated in the solid rock of one of the tunnels.

INTERIOR OF UNDERGROUND HOSPITAL, LEHIGH COAL AND NAVIGATION CO.

The upper illustration on the cover shows the outside view of the hospital. It is substantially built of concrete, and the approach is neatly paved with cement. The lower illustration is an interior view, the group consisting of the following, reading from right to left: Evan G. Evans, general foreman; James Harrington Young, company physician; Isaac M. Davis, mine inspector of the 17th anthracite district, and William E. Stickler, assistant mine foreman.

A COMPARATIVELY GERM-PROOF ROOM

The floor is covered with inlaid linoleum, the walls with Sanitas oilcloth paper and the ceiling with pale blue Sanitas paper. It is easy, therefore, to keep the room reasonably germ-free. The lighting is provided by 24 electric lights, strung along the vaulting line of the room and pendant from a chandelier in the center. The shelves alongside the medicine cabinet are of glass, supported by nickeled brackets. A stool and two couches with drop heads, all leather covered, are provided for the use of patients. There is also a Morris chair. The walls are hung with five Red Cross charts, showing the various parts of the human body. Set in the base of the couch on the left is a drawer, in which splints are kept.

The illustration on this page shows the electric radiator and a copper boiler for preparing hot water. To the right are a porcelain washstand and sanitary bucket. The shelf above the washstand is of ¼-in. plate glass, with nickeled brackets, and is provided with absorbent cotton, witch-hazel, sweet spirits of ammonia, liquid soap, cocaine and peroxide of hydrogen. Below will be noted the hair clippers and shears for removing hair near scalp wounds, also bandage shears and large nickel tweezers for removing splinters.

STRETCHERS AND BLANKETS

To those who have seen stretchers and blankets laid on the tipple rafters, or in malodorous sheds, the little stretcher closet in the left corner of the room will be of pleasing interest. Even this closet is lined with Sanitas paper. The blankets are hung from nickeled holders, shown on the left-hand side of the illustration. In this manner they are aired and better fitted for use than if rolled up and put in some dark corner.

The man administering the spirits of ammonia is John F. Boyle, the captain of the first-aid team at the Pittsburg meet. Seated in the chair is Harry Lewis, who furnished the information from which this article is prepared. Care is taken to produce a circulation of air through the room. A register 8x12 in. is set on the left of the door. This admits air to the room near the floor. A register situated near the springing line of the ceiling is connected with the return, and by means of this the air escapes.

This hospital certainly does credit to the "Old Company," and the men in shaft No. 8. The latter aver that from one end of the anthracite region to the other there is not to be found a better equipped hospital.

The Davy Lamp

The following is an interesting excerpt from a letter written in 1815 by Sir Humphrey Davy to Dr. Gray and the Rev. J. Hodgin: "Atmospheric air, when rendered impure by the combustion of a candle, but in which the candle will still burn, will not explode the gas from the mines. When a lamp or candle is made to burn in a close vessel, having apertures above and below, an explosive mixture of gas admitted merely enlarges the light, and gradually extinguishes it without explosion. Again, the gas mixed in any proportion with common air will not explode in small tubes, the diameter of which is less than one-eighth inch or even a larger tube, if there is a mechanical force urging the gas through the tube. . . I have never received so much pleasure from the result of any of my chemical labors, for I trust the cause of humanity will gain something by them."

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

The Interstate Commerce Commission has made an important award in the case of Meeker & Co. vs. the Lehigh Valley R.R. Co. This is an application of the decision arrived at some time ago on the general merits of the case. The Commission now says:

In our original report we found that the rates charged the complainant for the transportation of anthracite coal from the Wyoming region in Pennsylvania to Perth Amboy, N. J., during the period from Nov. 1, 1900, to Aug. 1, 1901, were unjustly discriminatory and in violation of Section 2 of the act, to the extent that they exceeded the rates contemporaneously charged the Lehigh Valley Coal Co. under the contract then in effect between that company and defendant; and we further found that the rates in effect from Aug. 1, 1901, to July 17, 1907, were unreasonable to the extent that they exceeded rates of $1.40 per gross ton on prepared sizes, $1.30 on pea, and $1.15 on buckwheat.

On the basis of its conclusions in the former report and upon consideration of the evidence adduced at the hearing upon the question of reparation, the commission now finds that the complainant suffered damage to the extent of $11,009.33 during 1900 and 1901 and to the extent of $58,236.45 from 1901 to 1907. The complainant is therefore awarded the above amounts together with accrued interest, making a total of approximately $100,000.

Privately Owned Coal Depots for the Panama Canal

The coal question has figured considerably during the past in the hearings before the Senate Committee on Interoceanic Canals, which is now working on a revision of the canal bill passed by the House, for submission to the Senate. The committee has been strongly urged to permit the establishment of private depots in the Canal zone for the sale of coal, on a commercial basis. There is evident a considerable disposition to permit the establishment of such depots, but none to abandon the idea of the governmental sale of coal, or to limit the government to the supplying of naval and other ships belonging to the public. Whatever liberty is granted to the private individuals who wish to sell coal in the Canal zone, will be given with the understanding that the government is to continue to compete in furnishing this material.

Facts and figures have also been laid before the committee with reference to the probable effect of the trade in coal on the development of coastwise business for American ships. B. H. Baker, of Baltimore, asserted that if railroad-owned ships could be prohibited from going through the canal, there would be a great growth of coastwise business, making a demand for coal which would move, he claimed, in large quantities from the terminus of the Virginian Railway to the eastern gateway of the canal. This coal, he asserted further, would move in American vessels. This was presented as an additional argument against allowing railroad-owned ships, specifically those of the Pacific Mail Steamship Co., to go through the waterway.

Alabama

Birmingham—A meeting of the merger committee, in charge of the proposed consolidation of the Alabama Coal & Iron Co. and the Southern Iron Co., was held in New York, May 23. It was expected that some decisive step would then be taken, but so far no definite announcement has been made.

Coal dealers and operators from Tennessee, Alabama, Georgia, Mississippi and Louisiana met in conference here recently in an effort to reach a better mutual understanding on a number of matters affecting the trade. The questions of car-load weights and points of weighing were discussed.

Montgomery—A proposed ordinance, prohibiting the use of any coal other than anthracite within the city limits, is meeting with determined opposition on the part of local coal men and large consumers.

Colorado

Denver—At the Leyden coal mine, a Moffat property, lying 17 miles from Denver on the line of the tramway, the shafts have been lined with concrete and the whole mine made as nearly fireproof as possible. This work has been done at an expense of some $300,000 and was undertaken largely because of a disastrous fire two years ago in which 10 men lost their lives. The output of the mine is now 500 tons a day and will be increased to 1000 tons.

The Denver & Rio Grande R.R. and the Colorado & Southern Ry. have been ordered by the Interstate Commerce Commission to file before July 20, regulations to govern the ratings of coal mines on their lines in Huerfano and Las Animas Counties, and to provide for an equitable distribution of coal cars. The order was made on complaint of the Colorado Coal Traffic Association, members of which alleged the roads unjustly discriminated against certain coal operators.

Illinois

Hillsboro—Options on 1400 acres of coal land near Donnellson were recently transferred to Frank P. Blair, of Chicago, president of the Shoal Creek Coal Co., and it is understood that these options will be taken up by June 1. It is not known as yet just what the intentions of the Shoal Creek company are with regard to this property.

The Hillsboro Coal Co. is securing options on about 2000 acres of coal land in the vicinity of Fillmore. It is understood that the coal is to be held for development sometime in the future and that a mine will be opened, probably near Fillmore.

Benld—As a result of the riot at Benld recently, the coal operators of the fifth and ninth Illinois districts have named a committee to meet with representatives of the labor organizations to demand the establishment of a state constabulary.

Springfield—Initial steps have been taken in the transfer of the Barclay Coal Co.'s plant to a new corporation to be composed of prominent Springfield men. The new corporation will take over all leases held by the Barclay company.

Marissa—A thousand tons of coal, stored at the Advance mine of the Egyptian Coal & Mining Co., caught fire recently from spontaneous combustion, and after several days' labor the fire was checked, but it is estimated that 300 tons of the coal was consumed. The coal was stored close to the tipple, and only by strenuous work was the plant saved from destruction.

Streator—The new agreement between Illinois coal operators and miners was signed May 17, but the settlement has had little bearing on the reopening of the mines, a great number of which remain closed down, owing to dullness of the market. A revival of trade is expected if the Indiana miners continue to hold out against the proposed agreement in that state.

Indiana

Terre Haute—Acceptance of a tentative agreement for a two-year contract, and reference of the weekly pay question to the miners for a referendum vote, ended, on May 24, the stormiest joint conference in the history of Indiana miners and operators. The subcommittee reported to the special meeting of the joint conference that an agreement had been reached on all matters, except the contention of the miners for a weekly pay. It was decided to leave the question to a referendum vote. For the third time within a week, the wage-scale committee reported back to the joint conference its inability to reach an agreement, or even a basis for a settlement. John P. White, international president, made a forcible speech, explaining in detail his position in relation to the Indiana mine workers' demand for the weekly pay, and explained to the miners' delegates that the vote meant either a return to work without the weekly pay and with the other concessions granted, or a strike. A vote was ordered in all the locals of the district for May 27, to decide this question finally. If the miners vote to accept the wage agreement without this provision, the mines will resume work June 3.

The miners in many localities feel so strongly on the subject of a weekly pay and the radical element among them has wrought the men to such a pitch that they recently burned in effigy President White and other officers of the national union, who are urging them to accept an agreement which provides for a semi-monthly pay, as at present. If the referendum vote fails to ratify the proposed agreement, a strike will be in force in Indiana.

Vincennes—The Knox Coal Co., of Bicknell, on May 24, sold its mine and all holdings near Bicknell to the Worth-Huskey Coal Co., of Chicago, for $50,000.

Linton—The Forschner Coal Co. has purchased the Sponsler mine from the United Fourth Vein Coal Co., and will work the coal that can be taken out of the shaft and strip the coal that is too near the top to be mined. The company has invested $30,000 in stripping machinery, and the dirt taken off the coal will be shipped to Chicago for use in filling up the lake front.

Iowa

Des Moines—Miners of district No. 13, United Mine Workers, in convention here May 18, refused to accept the wage scale agreement, submitted by the subcommittee of operators and miners. The convention adjourned after refusing its scale committee another chance to confer with the operators. The delegates voted to submit the proposition to a referendum vote of the mine workers.

Kentucky

Van Lear—The mines of the Consolidation Coal Co. at this place have been closed for some time on account of a strike. Trouble arose over an attempt at organization of the miners and the appointment of a check weighman.

Madisonville—Because of the delay in making payments on the 50,000 acres of coal rights recently purchased from farmers in this vicinity by a French syndicate, threats are being made that the deal will be called off. The syndicate, represented by William Lynch, of Dawson Springs, closed the deal for coal rights in what is known as the Beulah fields, at a price of $10 an acre. Payments have been slow and irregular, and hence the dissatisfaction.

Louisville—The Leahy Coal Co., Dougherty & Lanning and the Asher Coal Co. have been merged and taken in by the Southern Coal & Coke Co. The Asher plant which was taken over is one of most uptodate coal elevators in the country, and the largest in the South. As a result of this purchase, the output of the Southern company's mines in the Jellico district of Tennessee will be greatly increased, it is said. The transaction has been pending for some time.

The Cincinnati, Licking Valley & Virginia R.R. has filed articles of incorporation with the Railroad Commission of Kentucky. The company is incorporated with $80,000 capital stock. J. B. Walker, of Birmingham, Ala., is principal stockholder. The railroad company will build a line from Cynthiana, Ky., into the coal fields to the eastern part of the state, following the valley of the Licking River.

Harlan—The extension of the Louisville & Nashville RR. Co., from Harlan to the mining properties in that vicinity, has been completed and a number of important new producers are now shipping. The Clover Fork Coal Co. has begun production, and the Harlan Town Coal Co. will be ready to ship within two weeks. The Harlan Coal Mining Co., which recently let contracts for its equipment, will not be ready to begin operations until early in the fall.

Barbourville—The Interstate Coal Co., of Barbourville, which has been buying a great deal of property in the Brush Creek field of Knox County, has paid $250,000 for the 4000 acres of coal land of the Cumberland Coal Co. The property has three large mines in operation and others are to be opened. George L. Carter, who controls the Interstate Coal Co., has made investments of over $1,000,000 in the Brush Creek field.

Middlesboro—The Fork Ridge Coal & Coke Co., of which C. S. McManus is president, has just installed two Montgomery washers at its mines. The Winona Coal & Coke Co., which is controlled by the same interests, is installing a washer plant made by the American Concentrator Co. A 300-ton Montgomery washer has been installed at the mine of the Columbia Coal Co., of Gronty County. The washer is electrically operated. The capacity of the mine is 350 tons a day.

Missouri

Kansas City—An arbitrator to settle disputes between the coal miners and operators of the Southwestern district, was selected, May 15, by the general committee that for three weeks had been threshing out the terms of a new 2-year contract.

Montana

Great Falls—The annual convention of district No. 27, United Mine Workers, which district includes Montana, will be held in Great Falls, beginning Aug. 10. This convention will decide on the wage scale to be demanded under the next agreement. It is expected that it will be attended by about 100 delegates from the miners' unions.

Ohio

Hamden—The Superior Coal Co., operating a group of mines in Jackson County, is in a receiver's hands, but the business of the company will be continued. On May 18, the Knickerbocker Trust Co., of New York, filed suit to foreclose a mortgage to the amount of $193,000. Mr. Hersloff, of New York, has been appointed receiver, pending foreclosure proceedings. The company owns 8800 acres of coal lands and 4000 acres of mineral rights, near Wellston, Coalton and Jackson, with office in Jackson.

Coshocton—Seventy-five men at the Morgan Run colliery, recently went on strike in sympathy for the mine mules. The men stated that they did not think that the mules received proper treatment and said that they would remain on strike until assured that the mules would be humanely treated.

Columbus—Some dissatisfaction is felt by machine miners over the fact that the 4c. increase granted under the Cleveland wage settlement will, with the exception of a small fraction, go to the loaders. It was this point that protracted the session of the Hocking subdistrict joint convention, which adjourned recently after a ten days' stormy session. The operators were in favor of a larger share going to the machine men.

The Pomeroy Coal Co., of Columbus, has been incorporated with an authorized capital stock of $50,000, to take over the property of a company of the same name, which was chartered under the laws of West Virginia. The property consists of

600 acres of coal lands at Hobson, in the Pomeroy Bend field and is one of the best mines in that district. The product of the company will be handled through the Maynard Coal Co., of Columbus.

Zanesville—The Saltillo Coal Co., which has operations at Saltillo, recently sustained the loss of a large power house by fire. The company suspects that an incendiary is responsible for the loss. The plant will be rebuilt.

Crooksville—With the resumption of work at the two largest mines in the Crooksville district, May 22, the coal trade in this part of the state took on renewed activity. Practically every mine in the district is now at work and steady operation is predicted.

Pennsylvania

BITUMINOUS

Pittsburgh—An investigating committee, consisting of three members of the international executive board United Mine Workers, met here, May 25, to investigate the affairs of district No. 5. It is charged that the abrupt adjournment of the convention, Apr. 17, was illegal and Francis Feehan, district president, is threatened with impeachment by supporters of Michael Halapy, a rival candidate for the presidency.

It is rumored that the Pennsylvania R.R. may undertake the acquisition of the Buffalo & Susquehanna R.R. and the construction of 30 miles of connecting track. This would provide a route from Punxsutawney to Pittsburgh, 30 miles shorter than any existing line and would open up a large area of virgin coal territory. One of the largest coal operations in the section is located at Sagamore, and it has developed that the Buffalo & Susquehanna Coal Co. has under lease nearly all the accessible coal for a distance of about 16 miles south of Sagamore.

Johnstown—The Wilmore Coal Co., which is the land-holding concern of the Berwind-White Coal Mining Co., has purchased about 300 acres of land in Crab Valley, about 10 miles from Windber and it is understood that coal will be mined on the property and a tipple built. Rumor also has it that a railroad connection will be built across the Allegheny Mountain, through the Kinzey gap.

Undeveloped coal lands in the Jenner region are rapidly being optioned and it is believed that the agents are working in the interests of the Western Maryland R.R. Coal land in Milford, Black, Middlecreek and Upper Turkeyfoot Townships is being bought. The securing of options by agents of the Western Maryland has been interpreted by property owners in that district to mean that the road is contemplating the extension of their tracks from Rockwood. In case the branch is built, the connection with the main line will probably be made at Rockwood, and will extend through the Glade Run district.

Dubois—The Logan Coal Co., of Beaverdale, has just completed a large fan at its No. 4 mine and added additional territory, which will mean a larger output. The company has also added about 800 acres to the No. 2 mine, and improvements will be made.

ANTHRACITE

Scranton—Practically every mine in the anthracite region resumed operations Wednesday morning, May 22, the mine workers reporting for work in accordance with the order of the United Mine Workers of America, calling off the seven weeks' suspension. Scarcity of labor confronted the mine bosses, and while the collieries are operating, it was stated that the mines would not come near producing the normal amount of coal for some time to come. The scarcity exists chiefly among miners and laborers. So far as company work is concerned, there is no appreciable lack of men and boys.

Wilkes-Barre—Hundreds of miners have arrived here from western Pennsylvania, whence they journeyed when the anthracite mine suspension began. They were attracted home by the announcement that the hard-coal mines have resumed operation.

The fight of the Ridgewood Coal Co. against the Lehigh Valley R.R. Co., because of the railroad's failure to provide switching facilities at the Ridgewood property, at Newport, Luzerne County, assumed the form of a $500,000 lawsuit, May 23. The case was threshed out before a commissioner for the Interstate Commerce Commission a year ago. The coal company complained that the railroad company had refused to install a switch connecting the plant with the main line of the Lehigh Valley, and, further, that the road refused to permit the coal to be carted by team across its tracks. The Interstate Commerce Commission decided in favor of the coal company and ordered the Lehigh Valley to install the switch.

Hazleton—The men at the strippings of J. H. Dugan & Co., who went on strike recently, returned to work, May 24, when a 5½ per cent. wage increase was granted. The nine-hour shift was refused. The employees at the strippings of Benjamin & Co., at Harleigh, went out, May 24, for a 10 per cent. advance and a nine-hour day. Work has been resumed at the Janesville colliery of the Lehigh Valley Coal Co., where the men struck, May 22, because of the failure of 12 of their number to join the union. The miners at the collieries of the Lehigh & Wilkes-Barre Coal Co. gave notice recently, that if the nonunionists at those operations did not become identified with the United Mine Workers, all would go on strike.

Rhode Island

Portsmouth—The Rhode Island Coal Co.'s property was sold at a receiver's sale at Newport, May 17, for $50,000, to Robert G. Hay, of Boston, secretary of the old company. His was the only bid. It is the intention of the stockholders to reorganize under the name of the Portsmouth Coal Co., with a capital of $800,000, and the board of directors of the reorganized company will probably consist of Robert M. Burnett, H. M. Whitney, W. H. Joyce, W. F. Carlin and Joseph Weeks, all of Boston. William F. Dodge, mining engineer, estimates that on an output of 120,000 tons per annum the profits should be $124,760, equivalent to 15½ per cent. on $800,000 capital.

West Virginia

Charleston—By the formation of the Standard Fuel Co., of this city, capitalized at $7,000,000, the gas interests of Charles W. Swisher, including the Swisher Oil Co.; oil and gas property in the New Straitsville district of Ohio, and in Ritchie and other counties in this state, were taken over. In addition to these interests it is reported that the oil and gas and some coal interests of the Chilton, MacCorkle & Chilton firm, including those of United States Senator Chilton, are also in the combination. It is also reported that considerable Philadelphia capital is brought into the combination.

Wheeling—The miners' convention, which had held meetings in this city during the preceding week for the purpose of trying to settle the differences with the operators of the Fifth Ohio subdistrict, went into session again, May 20, to take up charges preferred against President John Moore by two of the locals represented at the convention.

Bluefield—It is generally reported that the Greeno and Bruce mines, located a short distance from Coeburn, have changed ownership. It is thought the mines will become part of the Mingo Hollow Coal & Coke Co.'s operations.

Great Britain

London—Four men are known to have been killed and many injured, May 18, in a mine explosion near Newport, in Monmouthshire. There was an unconfirmed report that 18 persons had been killed.

The Federation of Miners adopted resolutions, May 22, declaring that under the decisions of the minimum-wage boards in many districts, especially in South Wales, the men are unable to make even living wages. The federation demands that Premier Asquith at once call on parliament to amend the law to remedy the defects already apparent.

Personals

Edgar Kudlick, consulting mining engineer of the Lehigh Valley Coal Co., was recently a visitor in New York.

F. W. Wiegand has been appointed shipping agent of the Davis Coal & Coke Co. with headquarters at Cumberland, Md.

W. B. Geary has resigned his position with the H. C. Frick Coke Co. to become superintendent of the Elm Grove plant of the W. J. Rainey Coke Co.

John Steele, of Alma, Kan., has been chosen by the operators and miners of the Southwestern district as arbitrator in all disputes which may arise in this field.

W. E. Hartman, of Joliet, Ill., recently delivered a lecture on "Byproducts of Coke Ovens" before a meeting of the Engineers Society of Western Pennsylvania in Pittsburgh.

James Needham, president of the St. Paul Coal Co., the coal-mining subsidiary of the Chicago, Milwaukee & Puget Sound R.R., has left for an extended business trip to Montana.

William Z. Price, mining engineer, with the Tennessee Coal, Iron & R.R. Co., has resigned his position at Birmingham, Ala., to accept a similar position with the Pittsburgh Coal Co. at Pittsburgh.

W. C. Perry has been appointed chief engineer of the Davis Coal & Coke Co. with headquarters at Cumberland, Md. Mr. Perry is a Western man who has been in the employ of the company for a number of years.

F. R. Wadleigh, fuel engineer and assistant general manager of the Chesapeake & Ohio Coal & Coke Co., recently visited Akron, Ohio, where he was interested in the demonstration of a new chain-grate stoker for coking coals.

C. J. Johnson, until recently division engineer of the Blockton Coal Mine division of the Tennessee Coal, Iron & R.R. Co., has been appointed assistant superintendent of that division with headquarters at Blockton, effective June 1.

Frank Peabody, of Chicago, president of the Peabody Coal Co., in company with W. L. Ross, vice-president of the Chicago & Alton R.R., recently visited a number of mining properties, in which he is interested, in the vicinity of Springfield, Ill.

H. S. Mervin, of Columbus, Ohio, has been elected secretary-treasurer of the New Pittsburgh Coal Co. to fill the vacancy caused by the death recently of Harry R. Beeson. Mr. Mervin has been with the company for 10 years and has been auditor since 1906. James A. Rundio has been appointed general sales agent, and W. D. Morse has been made auditor.

Obituary

Clarence S. Whitney, prominently identified with the coal business of Kansas City, Mo., for the past 25 years and lately affiliated with the Gray-Bryan Coal Co., died, May 15, at his home in that city. Mr. Whitney was born in Clinton, N. Y., in 1850.

Allen H. Horton, aged 58, for a number of years general manager for the Pittsburgh Coal Co. and widely known in coal and navigation circles throughout the Great Lakes region, died, May 21, at Solon Springs, Wis., where he had gone in quest of health. Maj. Horton lived for a number of years in Buffalo, N. Y., where he was connected with the Lehigh Valley Coal Co. From there he went to West Superior, Wis., as general manager of the new Lehigh Coal & Iron Co. and later became vice-president of the Youghiogheny & Lehigh Coal Co., in St. Paul. He leaves a widow and one son

Publications Received

FIRST ANNUAL REPORT, U. S. BUREAU OF MINES. Joseph A. Holmes, director. 57 pp., 6x9 in., illus. Government Printing Office, Washington, D. C.

LOCOMOTIVE DRAFTING AND ITS RELATION TO FUEL CONSUMPTION. By H. B. MacFarland. 85 pp., 6x9 in., illus. The International Railway Fuel Association, Chicago.

AN INVESTIGATION OF THE COALS OF CANADA. By J. B. Porter, R. J. Durley and special staff. Vol. I, 233 pp., 6½x10 in., illus., 62 plates, 31 drawings, 5 maps. $1. Government Printing Bureau, Ottawa.

This is the first of six volumes which will embody the report of investigations that have been carried on since 1906, under the direction of the Mines Branch of the Canadian Geological Survey. The work was conducted in the laboratories of McGill University, by Dr. Porter, head of the mining department, and a specially selected staff. The following subjects are covered in Vol. I: The coal fields of Canada; collecting coal samples; sampling in the testing plant and laboratory; coal washing; and the manufacture and testing of coke.

Trade Catalogs

The Manhattan Drilling Co., New York. Pamphlet. The Dobbins core drill. 20 pp., 6x9 in., illus.

The "S-C" Regulator Co., Fostoria, Ohio. Pamphlet. 24 pp., 6x9 in., illus. Descriptive of "S-C" boiler feed-water regulators.

The Goulds Manufacturing Co., Seneca Falls, N. Y. Bulletin No. 110. Single Stage, Double Suction Centrifugal Pumps. 16 pages, 7¾x10 in., illustrated

Ingersoll-Rand Co., 11 Broadway, New York. Bulletin, form 7004, 12 pp., 6x9 in., illus. This catalog is descriptive of Cameron steam pumps. It shows the different styles manufactured and gives tables of sizes and capacities, together with prices.

Construction News

Brockwayville, Penn.—The McKnight Coal Co. is planning to make improvements and install additional equipment.

Duquoin, Ill.—The Majestic mine is receiving figures on an electrical plant and other improvements, to cost about $25,000.

Marion, Ill.—The Scranton Big Muddy Coal Co. is receiving bids for new boilers, and also for an electrical plant to replace the air plant now in operation.

Connellsville, Penn.—The Unity Connellsville Coke Co. is taking bids on the construction of 20 new ovens. Contract will be awarded in the near future.

Birmingham—The Queen Quality Coal Co., recently incorporated, will develop 240 acres of coal land and will require equipment. Simon Levy, Birmingham, is president and treasurer.

Marquette, Mich.—The Pittsburgh Coal Co. has acquired the George Kemp coal dock at the Soo and is reported to contemplate increasing its capacity to 40,000 tons at an expense of about $100,000.

Johnstown, Penn.—The Wilmore Coal Co.—a Berwind-White subsidiary—has purchased 300 acres of land near Reitz, in the Crab Valley, and it is reported that a mine will be opened and a large tipple built.

Christopher, Ill.—The Christopher Coal Mining Co., composed of a number of former officials of the Zeigler District Colliery Co., is to sink a new mine two miles from this place. Work will commence within the next week or two.

Marion, Ill.—The St. Louis Coal & Coke Co., of St. Louis, has bought the White Ash mine of the defunct Standard Collieries Co. It is understood that the new owners will spend several thousand dollars in improving the mine and the washer.

Knoxville, Iowa—The Anderson Coal Co., of Des Moines, is preparing to sink a new shaft on coal property in East Knoxville township, four miles from here. A spur track is being extended from Flagler to the new shaft, a distance of one mile, by the Rock Island R.R.

Dubois, Penn.—The Beaver Run Coal Co., of Beaverdale, will make a second opening on its property and equip the new mine with electric motor haulage and electric cutting machines. A ventilating fan is being installed. The workings will have a capacity of 1000 tons daily.

Duluth, Minn.—The Pittsburgh Coal Co. has awarded a contract to the Barnett & Record Co. to extend its No. 5 coal dock at Allouez Bay, 1200 ft., which will give it a total length of 3500 ft. by 45 ft. wide. It will then have a storage capacity of one million tons and be the largest coal dock in the Duluth-Superior harbor. The estimated expenditure is $300,000.

Ridgway, Penn.—The Hyde-Murphy Co., of this place, has been awarded two contracts for the construction of three mining towns in Indiana County. One is with the Jefferson & Clearfield Coal & Iron Co. for the erection of 50 modern houses at Jacksonville. Another is for the erection of 75 houses at Lucerne, for the Rochester & Pittsburg Coal & Iron Co., and the third is for the erection of 50 houses at Yatesboro for the Cowanshannoc Coal & Iron Co. New mines will be opened at those places.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

During the past week, new anthracite circulars have been announced at most points, showing advances ranging from 15c. to 50c. per ton. These have brought forth a number of strong protests from the public, and the demand is not so brisk as was expected, consumers believing that little can be gained by storing at the new prices.

Quotations in the Eastern bituminous markets are nominally being held, but there are well defined rumors of cutting and orders are generally scarce all along the line. Reports of a labor shortage at the mines, necessitating a curtailment in production, is the most encouraging feature in the trade at the present time. With anthracite again coming in, the soft coals will have to stand on their own merits and have settled down to the customary summer lethargy.

Mines in the Pittsburgh district are only working 60 to 65 per cent. capacity, orders being light and mostly on Lake business, with few contracts being renewed. The Lake shipping is now on in full blast, and as a result, there is considerable activity in the Ohio fields; the opening was late this season, and the operators are now endeavoring to catch up. While business continues good in the West Virginia fields, there has been a decided easing off in the strong demand and heavy movement which have been in effect there.

The resumption of work in the Kentucky fields has weakened the spot market in Alabama, but it is still fairly strong and more active than at this time last year. The Middle Western trade is in a peculiar position. The long shutdown at the Indiana mines has resulted in an acute shortage at some points, while the St. Louis market, on the other hand, is being flooded with a heavy over-production as a result of which coal is being freely offered at prices less than the cost of production.

Boston, Mass.

In the Eastern market there is no real change from a week ago. Pocahontas and New River prices are being normally held, but there are well defined rumors of low figures being quoted to place spot coal. Such business has enabled a few shippers to dump coal that was standing at the piers and so relieve the operators of any threatened embargo. The outlook on contract is no brighter, and all the agencies are becoming anxious. A few consignment cargoes at Providence and Portland have helped spread the idea among buyers that trade is to be slack through the summer, while a reported shortage of labor in West Virginia is the most favorable news heard this week.

The Pennsylvania shippers are combing over the market and few are pretending to get any advance over last year's prices. Georges Creek has slowed down along the line. The rush for anthracite for the present, and orders are scarce all will tend to curtail the tidewater movement of Georges Creek for a month or two anyway. All-rail trade is better in tone, and for the higher grades there is steady demand.

There is much comment over the new anthracite circular just given out by the companies. With the 25c. general advance and the loss of two months' shipments, the dealers stand to pay a 45c. greater opening price than in April last year, with not a good prospect of getting much June coal at that. The Boston retailers announced spring prices effective May 27 as follows:

Broken	$6.75
Egg	7.25
Stove	7.50
Chestnut	7.75
Pea	5.75
Franklin	8.75
Shamokin	7.75

These are 50c. higher than last year's summer prices on domestic sizes. There will doubtless be criticism from the public, when the actual advance to the mine workers is generally understood to be so small. The first shipments are expected to leave Philadelphia soon after June 1.

Wholesale prices on bituminous are as follows:

Clearfields, f.o.b. mine	$1.10 @ $.35
Somersets, f.o.b mine	1.20 @ 1.35
Georges Creek, f.o.b. Baltimore	2.70 @ 2.80
Pocahontas, New River, f.o.b. Hampton Roads	2.70 or less
Pocahontas, New River, f.o.b. cars Providence	3.35 @ 3.50
Pocahontas, New River, f.o.b. cars, Boston	3.45 @ 3.60

New York

Anthracite—Some of the anthracite companies have announced their new circular, effective June 1, during the past week. These show a nominal increase of 25c. a ton on egg, stove, chestnut and pea, the last being one of the steam sizes which it was thought would not be affected. Buckwheat Nos. 1, 2 and 3 remain unchanged.

The grades advanced represent 60 per cent. of the production, and amount to a net gain of approximately 15c. per ton. The present schedule is not meeting with much approval from either consumers or the companies, and has not yet been adopted by a number of the more important selling concerns.

We quote the new prices 25c. higher on the four sizes mentioned, as follows:

Broken	$4.50
Egg and stove	5.25
Chestnut	5.50
Pea	3.50
Buckwheat	2.75
Rice	2.25
Barley	1.75

Bituminous—The bituminous market is slow and the next month or two will see little outside of the routine business being done. The trade is still feeling the effects of the heavy storing done previous to the strike, although conditions are not far from normal for this period of the year.

The movement is confined entirely to contracts, and there is little call for spot coal, on which low figures are being quoted. The arrivals are, however, quite heavy, and with rumors of a labor shortage at the mines, there is a general good feeling among the producers. We continue to quote prevailing prices as follows:

West Virginia steam	$2.35
Ordinary grades, Pennsylvania	2.45
Fair grades, Pennsylvania	2.55@2.65
Good grades, Pennsylvania	2.70@2.80
Best Miller, Pennsylvania	3.00
Georges Creek	3.15

Pittsburgh

Bituminous—The coal market continues very slow, demand being far from expectations. While manufacturers are fairly busy and using almost the normal quantity of coal, their purchases are relatively light, indicating heavier stocking than was estimated prior to the suspension. The mines are running slightly better, but chiefly on coal to fill regular contracts in the Lake trade; there has not, however, been as much new buying as was expected in this branch. Operations are estimated at between 60 and 65 per cent. of full capacity and at some mines there is difficulty in securing men. We repeat former quotations, although they are largely nominal: Mine-run and nut, $1.22½; ¾-in., $1.32½; 1¼-in., $1.47½; slack, 82½c., per ton at mine, Pittsburgh district.

Connellsville Coke—Connellsville furnace coke for second half delivery has sold at $2.50, the highest price for more

than two years, and the price which a few weeks ago operators were hoping they would get but which they did not expect until considerable cheaper coke had been sold. The $2.50 sale was a contract for 12,000 tons a month over the second half. Previous contracts reported in the past few weeks for second half were two for 10,000 tons a month each, at $2.35, and one for 6000 tons a month at $2.40.

The operators are now all asking $2.50, but consumers are slow to take hold. Contracts made thus far involve about 38,000 tons a month, but there is still not far from 150,000 tons a month to be covered, against contracts which expire June 30. There are, of course, a number of contracts made for the whole year, as well as many term contracts running for a period of years.

A curious feature is that foundry coke has not advanced in consonance with furnace coke, good grades being offered for the year beginning July 1 at all the way from $2.35 to $2.50, though some operators hold their coke at $2.75 or higher.

Prompt furnace coke has eased off, and can readily be had at $2.25, while some odd lots have been sold at less. The decline is due to a temporarily good supply resulting from several furnaces unexpectedly blowing out. With this decline in prompt it will be harder for producers to sell at $2.50 for second half. We quote: Prompt furnace $2.25; contract furnace, $2.50; prompt foundry, $2.35@2.50; contract foundry, $2.35@2.50.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending May 11 at 398,956 tons, a decrease of 3000 tons, and shipments at 4385 cars to Pittsburgh, 6248 cars to points west and 1309 cars to points east, a total of 11,942 cars, a decrease of 49 cars.

Philadelphia, Penn.

As was predicted, the prices sent out by the anthracite operators saddled all of the increase that the miners will receive on three sizes, namely, stove, chestnut and pea, the prices for this market in the line trade now being as follows:

Broken (on contract)	$3.00
Egg	3.75
Stove	4.00
Chestnut	4.15
Pea	2.50
Buckwheat	1.50
Rice	0.85

On egg, stove and chestnut, there is a concession of 30c. per ton on any shipment made during the month of June. The increase noted above is 25c. on stove, 15c. on chestnut and 50c. on pea. The large increase on pea size is, no doubt, due to the fact that there is a steadily growing market for this size, particularly in this vicinity. Many householders use it for domestic purposes, and as it is understood that the output of this size is growing less, owing to improved methods of mining, and the natural offspring of a curtailed output, coupled with a heavy demand, is a higher price. The contract price of broken, which was advanced the first of the year at tidewater, still remains at the same figure of $3 for line business. The relative difference between stove and chestnut has been reduced to 15c. instead of 25c., as was the case all of last season. The prices of buckwheat and rice have not been changed in any way. At tidewater, there has been an advance of 25c. on all sizes.

The demand for coal is not as brisk as might be expected. Dealers report that there is slight increase, but the fact that there is so little to be saved by laying in stocks now, as against the fall, has caused many to postpone purchases until later. Retail prices are $6.75 for egg, $7 for stove and $7.25 for chestnut.

Buffalo, N. Y.

If the anthracite miners had stayed out longer it would eventually have had some effect on bituminous prices, but there is hard-coal enough so that all other fuels will have to stand on their own merits in the future. As a rule the bituminous dealers are not very hopeful. One of the operators says that he has made up his mind to lose money for three months or so.

There is no relief promised from the tidewater district. Reports from the market agree that it is "plugged full" of coal and promises to remain in that condition, perhaps all summer. Only a few operators here get into that market, but it affects the trade as a whole. There is not much coal unsold on track here, but it is said that there is considerable at various points in Canada.

The regular prices on bituminous hold, but they cannot be called strong, at $2.57½ for Pittsburgh three-quarter, $2.47½ for mine-run and $2.10 for slack. Coke is also rather weak at $4.50 for best Connellsville foundry. Furnaces in this district are running only moderately, some of them being idle.

The announcement of a general advance of 25c. in anthracite has resulted in much adverse comment, as it more than covers the increased pay to the miners so the consumer comes in for the whole of it, together with a small bonus to the operator. A supply is already on the way, though there has been no particular demand for it during the suspension.

As to the Lake trade all effort will now be made to keep the fleet busy till the lost ground is regained. If the Eastern demand is not large there will soon be a record-breaking activity on the lakes, for the trade is already nearly 20 per cent. behind last season to date. Some of the anthracite companies can make big spurts in mining, but not all of them. Tonnage has been taken at 30c. to the principal Lake Michigan ports, a small reduction from former seasons, and the same to Lake Superior ports.

Baltimore, Md.

Every vestige of the strike of the coal handlers in Baltimore has disappeared, and normal conditions now prevail at all of the railroad piers. While the settlement of differences between the coal handlers and their employers was a thing much to be desired, it has not brought about any marked improvement in the local market, so far as the demand is concerned. The market during the past week was heavy to say the least, and, consequently, prices were low.

For the past two or three weeks, there has not been the consumption that the trade expected at this time of the year, and not a few of the Baltimore operators are feeling the effects. Many mills, which are usually good customers, are now being operated on short time, and this is being reflected in the coal market.

Five steamers arrived in Baltimore during the week to load coal for Alexandria, Egypt. In all, about 22,000 tons of the product will be forwarded to that country.

President Bushrod M. Watts, of the Baltimore Coal Exchange, made an announcement during the week to the effect that the winter prices for anthracite would, in all likelihood, be maintained throughout the summer. The rates for the ensuing year will not be definitely fixed here until after June 1, but it is believed by the consumers here that the operators intend to keep up the winter prices and local retailers will be compelled to follow suit. Every year during the summer months there has been a reduction of 50c. on hard coal, but, according to Mr. Watts, this low price will not prevail this year.

Cleveland, Ohio

The market for steam coal still remains quiet, and dealers are buying very little domestic coal for stocking purposes; outside of renewing contracts, operators and jobbers are not doing much. Prices on No. 8 coal have dropped from 7½ to 10c. per ton, slack selling at 55c., mine-run, 90c. and 3¼-in., $1. As Lake production increases, the price seems to go lower, unless there is a concerted movement to hold it back from the market by track shortage.

Shipments of coal for the Lake trade have been quite large, but the supply of tonnage is far in excess of the demand, and the boats are delayed in loading.

Vessels are waiting at most of the docks, and in some cases have to make two ports to fill out cargoes. There will be a little hard coal next week, but it will be June 10 before there is much demand for tonnage in that trade.

Columbus, Ohio

The situation in Ohio is improving as the season progresses and activity now prevails in every branch of the coal trade with the exception of domestic. Prices are ruling firm and everyone engaged in the coal business is looking forward to a rather prosperous season. Since the mines have resumed operations, there has been considerable improvement in general business conditions which is being reflected upon the coal trade.

The opening of navigation was delayed because of ice in the Soo but now the season is on in full blast. The activity in the ore trade is aiding in a better movement of coal and the chartering of boats is going on actively. Some little trouble in the lake trade was caused earlier in the season by the decrease of 10c. a ton made by one of the largest shippers but the effects of this are rapidly passing away. The docks are now taking coal better and there is every prospect for an active trade during the entire season. Ohio lake shippers are preparing to ship even a larger tonnage than in 1911.

Railroad fuel contracts are the next thing to attract the attention of operators. Many of the larger railroad contracts will be renewed soon and there is some lively bidding. Operators hope to have more than a 5c. increase on these.

There is a fair demand for fine coal and a large amount of it is being made in connection with the lake trade. Prices on that grade are ruling firm.

Prices which prevail in Ohio fields are:

Hocking Valley	
Domestic Lump	$1.50
Egg	1.35
Nut	1.15
Mine-run	1.15
Nut, pea and slack	0.80
Coarse slack	0.60
Pittsburgh No. 8	
Egg	1.30
Mine-run	1.05
Coarse slack	0.65
Pocahontas	
Domestic lump	$1.50
Egg	1.35
Mine-run	1.15
Nut, pea and slack	0.75
Coarse slack	0.55
Kanawha	
Domestic lump	1.50
Egg	1.30
Mine-run	1.10
Nut, pea and slack	0.60
Coarse slack	0.50

Hampton Roads, Va.

The market at Hampton Roads during the past week has been quieter than at any time since the first of the year, but there has been a fair loading at the three ports every day. Shippers are now feeling the effects of the heavy stocking in anticipation of the coal strike during April. The greater portion of the movement now is on old contracts, but it is predicted that the situation on new contracts will shortly adjust itself. The prevailing price at Hampton Roads is now $2.70.

An interesting feature of the past week is the returns on coal from Hampton Roads to Boston for the first quarter of 1912. The total tonnage during the first quarter of 1911 was 212,568 tons, as compared with 430,248 tons this year, or an increase of over 100 per cent. This goes to show there was considerable activity at Hampton Roads, and the impetus thus far gained is sure to hold up at this port throughout the balance of the year.

Charleston, W. Va.

It is now practically certain that the month of May will see the heaviest production in the history of the Kanawha valley and likewise be the banner month in the number of tons shipped from West Virginia over the Chesapeake & Ohio. Cars have been plentiful, and the mines have been taking advantage of the opportunity. On the Chesapeake & Ohio the movement has been excellent, due to the borrowing of a number of engines from other roads. Along the Kanawha & Michigan, however, hundreds of T. & O. C. cars, already loaded, may be found crowding the sidings, awaiting movement to the lakes.

Prices have remained firm for some time, and are what operators declare to be good, considering the extremely low rate that obtained before the first of the year.

A number of the companies, owing to the good prices now prevailing, have signed the scale and are now in partial operation. These include the mines, about twenty in all, that did not sign the agreement some time ago in the Kanawha district.

Birmingham, Ala.

The Birmingham coal market continues fairly strong, though spot shipments are off. Resumption of work in the Kentucky fields is responsible for this.

One of the most favorable features in this trade is the growing tendency on the part of the railroads to substitute coal for the crude oil which they have been using. The advanced prices on oil, and the difficulty which is being experienced in getting a constant supply, has led the railroad officials to regard Alabama coal as less expensive and more reliable.

One of the adverse features of recent days has been the announced determination of a leading Southern railroad to confine itself to Kentucky coal exclusively, whereas it has been a consumer of considerable Alabama coal. In spite of this, there is probably more Alabama coal being sold for railroad use now than ever before. Improved facilities for loading coal to bunkers are also being rapidly perfected at New Orleans. During the past few days, the movement to river points and beyond has improved.

Indianapolis, Ind.

This has been a strenuous week in the Indiana market. Comparatively few mines have been working and long lines of cars have remained idle on the sidings. The public-service companies have, by dint of economy, secured enough coal to keep going, but this condition cannot last long.

Interest is concentrated on the joint conference being held at Terre Haute, and the prospects for a general resumption are much brighter than a week ago. The demand for a weekly pay, as provided in a statute enacted by the last legislature, which is of doubtful legality, has been holding thousands of miners in idleness; they are influenced by the radical element, who declare that they will never consent to an agreement that does not provide for a weekly pay. Now that the question is to be voted on, there are those who greatly fear that the vote will be adverse to waiving the weekly pay law.

St. Louis, Mo.

The Illinois mines still continue to open up, and the local market is almost stagnant. It seems to be a contest to see who can lose the most money in the shortest space of time, and all this in view of the fact that the fifth and ninth district operators have an organization and ought to know what their coal is costing them. The price of Standard lump has gone down to 80c. and mine-run is practically the same. The Carterville operators are getting a living price for their coal, but there are indications that they too will lose control of their market.

Nearly every railroad in East St. Louis has coal on track undisposed of, and this condition will probably continue from this time until early fall. Operators in the central portion of Illinois are shipping some coal to Indiana, on account of the shut down there.

The market is as follows:

Carterville	
6-in. lump	$1.25 @ 1.35
3x6 egg	1.25 @ 1.35
Nut	1.20 @ 1.30
Screenings	1.05 @ 1.10
Mine-run	1.00 @ 1.00
Standard	
2-in. lump	$0.80 @ 0.90
Mine run	0.80 @ 0.90
Screenings	0.85 @ 0.95

Minneapolis—St. Paul

It is rather hard to determine the sentiment of the market at present, with conditions dull and backward, as they have been for some weeks past. The prospects are very good, but they are almost wholly anticipatory, based upon the new crop, and the result is that little is being done in advance of present needs.

Contracting with steam users for the season is progressing very slowly; hardly any of the buyers are willing to take up the subject, because during the past two years contracts have proved to be less attractive than spot buying.

The advance of 25c. a ton on anthracite will have a tendency to stall the movement from the docks until later in the summer, as dealers and consumers will not be given any inducement to buy now.

Prices to dealers and steam users are being quoted as follows:

Youghiogheny	
Lump and stove	$3.40
Dock run	3.10
Screenings	2.40
Hocking	
Stove and nut	3.40
Dock run	3.00
Franklin County	
Lump, egg and nut	1.50
Mine-run	1.20
Screening	1.15
Carterville	
Lump and egg	1.50
No. 1 washed	$1.60@1.70
No. 2 washed	1.40@1.50
Harrisburg	
Domestic lump and egg	1.50
Steam lump	1.40
Mine-run	1.20
Screenings	$1.10@1.15
Springfield	
Domestic lump	1.50
Steam lump	1.25
Mine-run	1.15
Screenings	1.10

Portland, Ore.

Just now there is practically no demand for coal, excepting such as is required by the railroads and manufacturing establishments, which fluctuates very little. The weather has been warm except for a few days of rain, and indications are that from now on there will be little business for some time.

This is the time of year when thoughtful people begin to order coal and wood for the winter, but dealers say that prices are too high at present to induce people to buy at this time; hence there is no business in storage coal. Australian freights are prohibitive, and there seems no inclination to reduce domestic-coal values as yet.

Until prices are shaded, dealers look for very little advance business for future wants. The usual reduction on storage coal here is $1 per ton, but dealers say they have to pay too much to justify this cut. How soon it can be done, they seem unable to predict. If present high freights from Australia continue, the domestic product will have very little opposition from that direction the coming fall.

Production and Transportation Statistics

Norfolk & Western Ry.

The following is a statement of the commercial and company coal from mines on the N. & W. Ry., for the month of April, in short tons:

From	Commercial	Company
Pocahontas	1,124,850	112,178
Tug River	160,394	43,895
Thacker	160,688	56,128
Kenova	66,021	8,807
Clinch Valley	119,616	10,978
Total	1,631,569	231,986

Tonnage from the West Virginia mines was as follows, in short tons:

From	Tipple Coal	Total Coal
Pocahontas	20,291	1,192,069
Tug River	4,607	204,289
Thacker	4,726	216,816
Kenova	6,547	74,828
Total	36,171	1,688,002

Note.—Total shipments of coke, originating entirely in the Pocahontas field, amounted to 100,906 tons as compared with 128,816 tons in March.

Chesapeake & Ohio Ry.

The following is a statement of the coal and coke traffic over the lines of the C. & O. Ry. for February and March, and the nine months ending Mar. 31, 1912, in short tons:

Destination	February	March	9 Months
Tidewater	299,459	487,236	3,092,449
East	190,655	198,472	1,671,276
West	971,416	805,017	8,261,891
Total	1,461,539	1,490,725	13,025,616
Coke	17,180	22,932	170,548
From Connections			
Bituminous	17,650	20,060	173,950
Anthracite	4,742	3,330	29,976

Southwestern Tonnage

The Southwestern Interstate Coal Operators' Association has issued the following comparative statement of tonnage for January:

State	1911	1912	Increase
Missouri	248,159	281,453	33,294
Kansas	462,624	537,928	75,304
Arkansas	143,445	155,666	12,221
Oklahoma	251,411	348,982	97,571
Totals	1,105,639	1,324,029	218,390

Foreign Markets

Great Britain

Colliery outputs continue exceptionally heavy, and, as tonnage is still very slow in arriving, there are fears of pit stoppages. Prices have receded further, and are approximately as follows:

Best Welsh Steam Coal	$4.44
Seconds	4.26
Thirds	3.96
Best Dry Coals	4.32
Best Monmouthshire	3.90
Seconds	3.72
Best Cardiff Small Coal	2.28
Seconds	2.22

Prices for Cardiff coals are f.o.b. Cardiff, Penarth, or Barry, while those of Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days, less 2½%.

The following is a comparative statement of the British fuel exports for April, 1911-12, with the total for the first four months of the current year:

Grade	April 1911	April 1912	4 mos. 1912
Anthracite	168,668	29,793	587,7[illegible]
Steam	3,576,763	1,086,312	10,132,[illegible]
Gas	761,890	266,486	2,205,[illegible]
Household	105,811	45,654	341,[illegible]
Other sorts	234,749	66,326	696,[illegible]
Total	4,847,881	1,494,571	13,967,[illegible]

Financial Notes

The Pittsburgh & Erie Coal Co. gives notice that, pursuant to the terms of the mortgage, dated May 1, 1905, the trustee will receive sealed proposals up to Apr. 29 for the sale to it of bonds as described sufficient to make the sum of $13,387.03. The right is reserved to reject any or all tenders.

The following are the cash dividends paid by six of the large hard-coalers during the past 12 years:

Delaware, Lackawanna & Western	$57,500,[illegible]
Central R.R. of New Jersey	27,436,[illegible]
Delaware & Hudson	39,008,[illegible]
Lehigh Valley	23,450,473
Reading	44,100,[illegible]
Lehigh Coal & Navigation	13,775,[illegible]
	$205,270,773

The Pittsburgh Coal Co. has $27,071,800 preferred stock outstanding out of a total authorized issue of $32,000,000. Dividends are cumulative up to 7%, but the stock has not received the full rate to which it is entitled since the early part of 1905. Dividends were suspended from that year up to the close of 1909, but in 1910 and 1911 disbursements were at the rate of 5% per annum. Back dividend now amounts to approximately 36½%.

During the last 12 years more than 700,000,000 tons of coal have been mined from the properties of the principal anthracite companies and during the same period the aggregate value of these same companies has increased more than threefold. The Lackawanna is looked upon as a phenomenon, but it has increased only a little more than threefold, while Reading has increased sixfold and Lehigh Valley ninefold. The Central Railroad of New Jersey shows almost a threefold increase. The only new money put into any of these corporations is $20,000,000 to the Lehigh Valley and something over $2,000,000 into the Lehigh Coal & Navigation Co.

The United States Smelting, Refining & Mining Co. has issued $10,000,000 five-year collateral trust gold notes of the Utah Co., guaranteed principal and interest by the United States Smelting, Refining & Mining Co. The notes are dated Apr. 1, 1912, and are due April 1, 1917, and may be called on or after Apr. 1, 1915, at 101 and accrued interest. The notes will be secured by collateral representing entire ownership of the new railroad and interests in the coal properties. The guarantor company has no mortgage or floating debt and has only $4,000,000 of funded debt, and on Dec. 31, 1911, had net working capital of $7,[illegible]511. Its average net profits for the last six years were nearly 4½ times the interest charges on this issue.